

# **Site Management Plan**

## **Former Nansemond Ordnance Depot**

### **Fiscal Year 2005**



**US Army Corps  
of Engineers** ®  
Norfolk District



Issued December 2004

**Site:**

The Former Nansemond Ordnance Depot  
Suffolk, Virginia  
C03VA004500, Formerly Used Defense Site

**Prepared By:**

United States Army Corps of Engineers  
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Site Management Plan

Former Nansemond Ordnance Depot  
Fiscal Year 2005

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# 1 Introduction

This report presents the Site Management Plan (SMP) for the United States Army Corps of Engineers (USACE) Norfolk District activities at the Former Nansemond Ordnance Depot (FNOD) in Suffolk, Virginia. FNOD qualifies as a Formerly Used Defense Site (FUDS) pursuant to the Environmental Restoration Defense Account and the Defense Environmental Restoration Program (DERP), Chapter 160 of the Superfund Amendment and Reauthorization Act of 1986. The USACE is responsible for environmental investigations and remediation of FUDS. The Norfolk District is responsible for oversight of FUDS activities at FNOD, with assistance from the Baltimore and Huntsville Districts.

On 22 July 1999, the U.S. Environmental Protection Agency (EPA) placed FNOD on the National Priority List (NPL). FNOD was listed as a Non-Federal Facility Superfund Site, as the Federal Government does not currently control any property at FNOD. However, the EPA named the Department of Defense as a Potential Responsible Party for addressing environmental issues at FNOD. (64 Federal Register No. 140, 39878; July 22, 1999)

Federal Agencies remediating NPL (a.k.a. Superfund) sites commonly enter into Inter-Agency Agreements (IAGs) that cover roles and responsibilities during the clean up. The final IAG is still in negotiation. In this SMP, all references to an IAG will be to the draft IAG dated 2 June 1999, which contains mostly IAG model language developed by EPA and the Department of Defense (DOD). The EPA listed FNOD as a Non-Federal Facility Superfund Site because the Federal Government does not currently control any property at FNOD. Additionally, EPA named the DOD as a Potentially Responsible Party for addressing environmental issues at FNOD.

Due to the nature of past activities conducted at FNOD, it is divided into several smaller sites, categorized as either a Source Area (SA) or Area of Concern (AOC). This SMP summarizes investigations and activities to date for each area and provides work plans and schedules for Fiscal Year (FY) 2004.

Reference documents are located in the FNOD Administrative Record File (ARF) located at the Norfolk District.

## Public Involvement

The Norfolk District established a Restoration Advisory Board (RAB) in accordance with FUDS guidance. The RAB meets bi-monthly and provides an avenue for public involvement and input. Citizens are encouraged to attend RAB meetings and may review site documents, which are located in the Information Repository at the Tidewater Community College Portsmouth Campus Library. The Norfolk District also conducts Public Affairs Workgroup meetings as needed. Members of the workgroup include the Norfolk District Public Affairs Officer, EPA Region III, Virginia Department of Environmental Quality (VDEQ), the City of Suffolk and current property owners electing to participate.

## 2 Purpose

The purpose of this SMP is to disseminate environmental clean-up information in accordance with the requirements of the IAG and requires the following:

- A list of Source Areas, Areas of Concern, Areas of Interest, Operable Units, etc...
- Proposed environmental clean-up activities at each area and schedules including deadlines, near- and long-term milestones, significant target dates, and project end dates.
- Primary document submittal dates for the current fiscal year and subsequent two years.

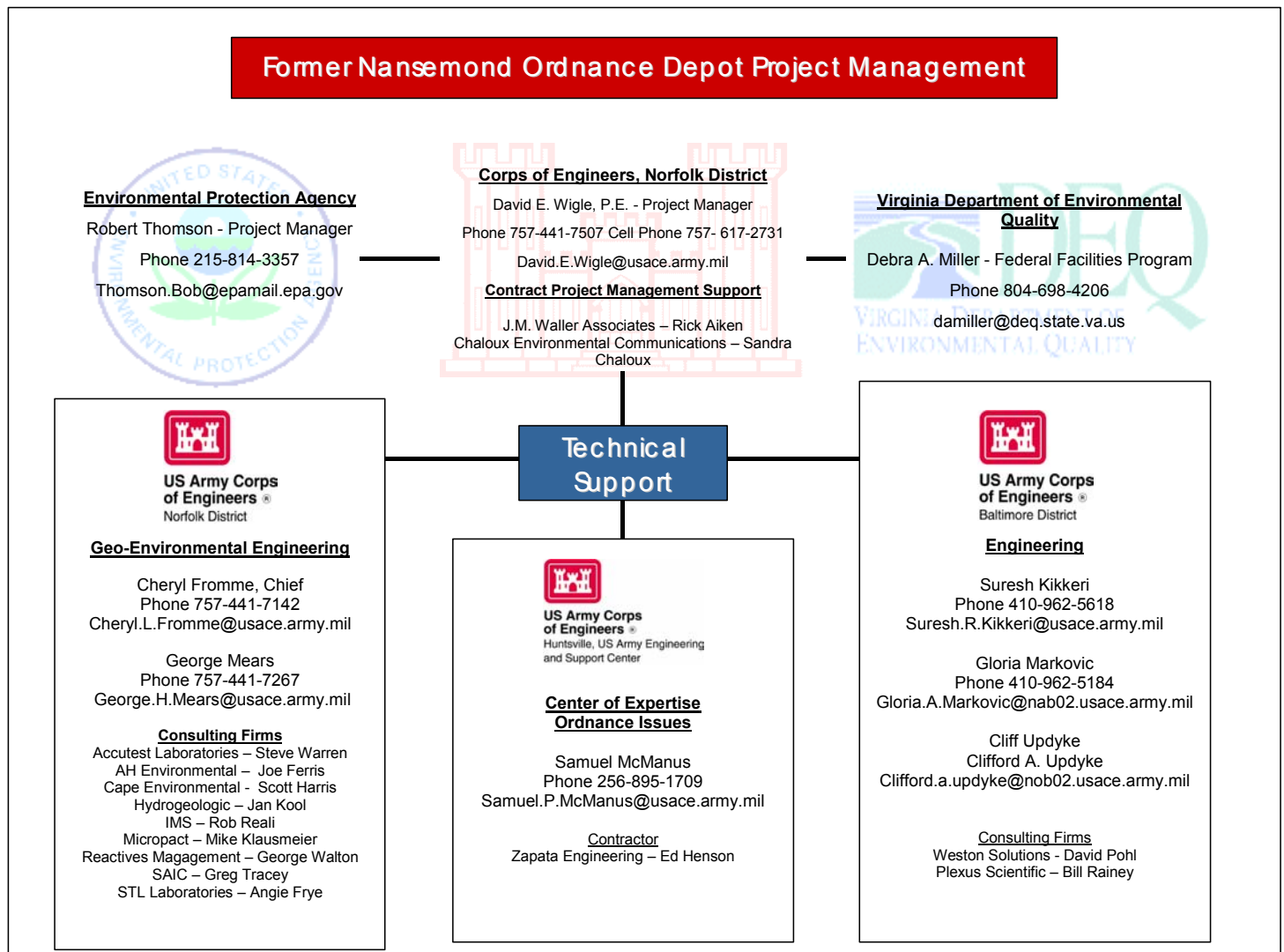
Additionally, the FNOD SMP is a reference to germane site documents. The ARF contains documents forming the basis for the selection of response actions at FNOD. The ARF may be searched using the document catalogue available on the Internet (<http://www.nao.usace.army.mil/Projects/Nansemond/NumberingRules.htm>).

### Historic Preservation Act Compliance

All site work completed under this SMP will be in compliance with State and Federal Historic Preservation regulations. To insure compliance with Section 106 of the National Historic Preservation Act, a Programmatic Agreement was signed by the Norfolk District, EPA Region III, the Virginia State Historic Preservation Officer (SHPO) and other interested parties.

The Archaeological Work Plan (AWP) appended to the Programmatic Agreement (PA) details how the agreement will be implemented. The AWP was developed and approved by Norfolk District, EPA Region III and the SHPO. The plan calls for the Archaeologist to review work plans, contracts, scopes of work and other planning documents in order to identify possible adverse effects to significant historic properties as a result of site activities. The plan includes a map of areas having high, medium and low probability of archaeological resources. The AWP also provides for review of ground-disturbing activities that occurred prior to implementation of the PA, monitoring of upcoming ground-disturbing actions in high probability areas and procedures to be followed in the event of an unexpected discovery of archaeological resources. (*Programmatic Agreement*, ARF 01-13-037 and *Archeological Work Plan*, ARF 02-01-025)

### 3 Organization Chart





## 4 History

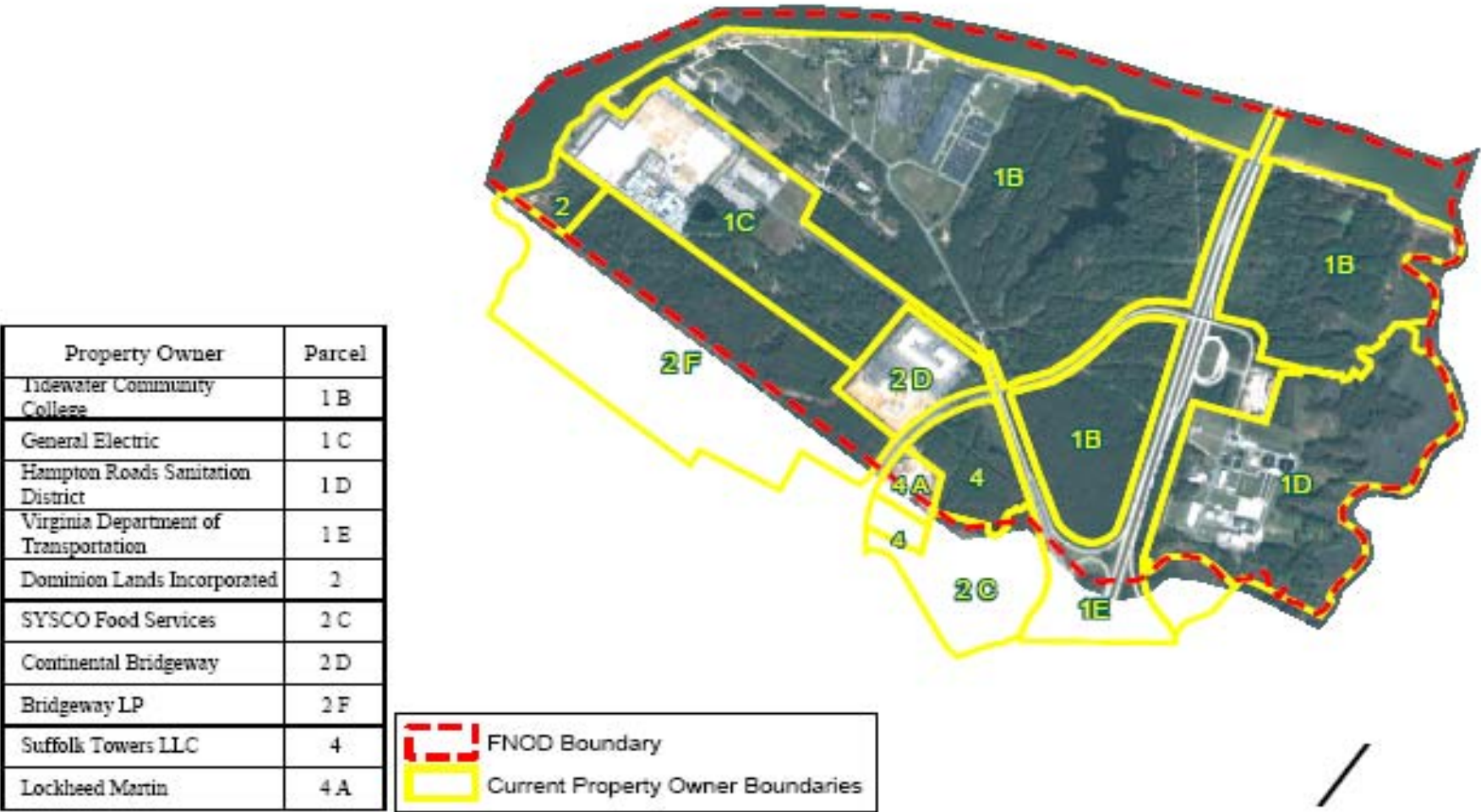
FNOD is located in Suffolk, Virginia and consists of approximately 975 acres. It is bordered by the Nansemond River to the west, the James River to the north and Streeter Creek to the east.

FNOD was constructed, beginning in 1917, to support the Port of Embarkation at Newport News, Virginia and was originally known as Pig Point Ordnance Depot. By 1918, the original depot included 28 Standard Ammunition Magazines, 25 High Explosive Magazines, 13 Smokeless Powder Magazines, 8 Primer and Fuse Magazines, 1 large warehouse, 16 barracks, 2 Officer's Quarters, a hospital, a garage, a fire house, a machine shop, an electric storage battery charging station and support buildings. Other structures included a pier, jetties, guard towers, mess halls, carpenter shops, a water tower, a renovation and salvage plant, railroad tracks and roads. The depot functioned as a storage and distribution center and performed reconditioning of munitions. Captured enemy munitions were also processed at this location. Between World Wars I and II the depot remained active, and in 1929 the facility name was officially changed to Nansemond Ordnance Depot. During World War II, the reconditioning, storage and distribution of ammunition continued.

In 1950, the facility was transferred to the Department of the Navy and named the Marine Corps Supply Forwarding Annex. Information concerning operations at FNOD between 1950 and 1960 is not available. In 1960, the site was declared excess and acquired by the Beazley Foundation Boys Academy. The Virginia Department of Highways received a right-of-way easement over a portion of the property, and 207 acres was sold to the Virginia Electric Power Company, now Dominion Lands. In 1965, 104 acres were conveyed to the General Electric Company (GE), and Nansemond County acquired a 4.7-acre right-of-way easement for a road in 1966. In 1968, the Academy closed and donated the property to the Virginia Department of Community Colleges. The Tidewater Community College (TCC) Portsmouth Campus currently occupies the site, less an 80-acre parcel conveyed to Hampton Roads Sanitation District (HRSD) in 1977. FNOD came to the attention of the Norfolk District in 1987, when evidence of ordnance and explosive waste was discovered and has been under investigation since that time. (*Archives Search Report*, ARF 01-13-006 F)

The current property owners are TCC, Dominion Lands, Continental Bridgeway, Suffolk Towers LLC, Bridgeway LB, GE, Virginia Department of Transportation (VDOT), HRSD, Lockheed Martin, and SYSCO Foods.

Figure 4.1 - Current Property Owners



## 5 Summary of NPL Status

EPA Region III issued the Final Hazard Ranking System (HRS) Package in January of 1999. This package was a culmination of multiple site investigations and resulted in the identification of seven waste Source Areas (SAs). The SAs were evaluated and hazard exposure pathways were assigned numerical values. The final HRS site score for FNOD was 70.01, and a score of 28.5 or higher qualifies a site for placement on the NPL.

The primary event prompting the EPA investigation of FNOD was the 1987 discovery of “bulk explosives, small arms munitions, and other ordnance items, both spent and unexploded” and a several ton slab of crystalline 2,4,6-Trinitrotoluene (TNT) in the 2 to 3 acre site known as the TNT Area. A Remedial Investigation resulted in removal of Munitions and Explosives of Concern (MEC) and contaminated soil from the site. Soil sampling identified Chemicals of Concern (CoCs) including Metals and Explosives.

The SAs identified in the Final HRS Report included:

- 1 Removal Area – Residual Contaminated Soil (TNT Area)
- 2 Beachfront Disposal Area (James River Beachfront)
- 3 Impregnation Kit Area
- 4 Horseshoe Pond Disposal Area
- 5A Steamout Pond
- 5B Park Drive Disposal Area/Burning Ground (Main Burning Ground)
- 6 Track K Dump

*(Final Hazard Ranking System Package, ARF 01-13-031)*

## 6 Screening Methodology: Technical Approach

The Source Areas described in the HRS Package are investigated following the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) regulations and guidance. In addition to SAs, there are several Areas of Concern, areas where past activities may have contaminated adjacent media (soil, sediment, surface water, groundwater). AOCs are identified by examining historical evidence, including aerial photographs, and evaluated using the Site Screening Process for FNOD. The Project Team, by consensus, determines if the AOC warrants listing in the SMP. Potential SAs are proposed first as AOCs by members of the Project Team.

Once an AOC is identified, the Site Screening Process (SSP) begins with a Desktop Audit (DA) and site visit. The DA is a review of existing information in order to evaluate and document past FNOD activities, which may have resulted in the release of hazardous substances at the AOC (similar to a Preliminary Assessment conducted for SAs under CERCLA). The site visit is a visual inspection of the AOC designed to aid in site characterization; evaluate current site conditions; determine possible contaminant sources, chemical migration pathways, potential human and ecological receptors; and identify potential sampling locations and media. Screening level sampling of surface soil, subsurface soil, surface water, groundwater, sediment or suspicious media may also occur in conjunction with the DA. Results of the site visit and screening level sampling are documented in the Desktop Audit. Also included in the DA is an AOC-specific Conceptual Site Model (CSM) depicting the possible contaminant sources, exposure pathways and receptors.

If the Desktop Audit indicates that no further action is required at the AOC, it may be removed as an AOC upon agreement by the Project Delivery Team. Any agreement to de-list an AOC must be documented in the ARF and SMP.

If the Desktop Audit indicates that an AOC requires further study, a Site Investigation (SI) will be performed. The first step in the SI is the development of an AOC-specific Work Plan, including a Sampling and Analysis Plan (SAP).<sup>1</sup> As a minimum, media will be analyzed for Target Compound List (TCL) Volatile and Semivolatile Organic Compounds, Pesticides, Polychlorinated Biphenyls (PCBs), Dioxins, Target Analyte List (TAL) Metals and Cyanide. Analyses for additional compounds (e.g. Total Petroleum Hydrocarbons, Explosives, and Chemical Warfare Material and Degradates) may be requested based on suspected AOC-specific past uses. Field work and sample collection proceed after all appropriate regulatory agencies and Project Delivery Team members approve the Work Plan and SAP.

The analytical results are independently validated and human health and ecological risk screening is performed using the following criteria:

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<sup>1</sup> Further sampling is conducted in order to determine the presence or absence of contaminants, provide data for human health and ecological Risk Assessments, and further delineate the extent of contamination. The SAP details the number, type and location of samples to be collected. The Master Quality Assurance Project Plan for FNOD (MQAPP) and SSP list analyses to be performed during the SI.

1. EPA Region III Risk Based Concentrations (RBCs) for Residential and Industrial Soil or Tapwater
2. Chemical-specific Screening for Lead and Iron
3. EPA Region III RBC Soil-to-Groundwater Screening Levels (SSLs)
4. Applicable or Relevant and Appropriate Requirements (ARARs)
5. Established Background Levels for FNOD

Validated analytical results and GPS coordinates of sampling locations are added to the existing FNOD database and used to aid in data analysis, reporting and visualization in ArcGIS and the groundwater modeling software. (*Environmental Data Management Plan*, ARF 02-04-003)

Based on the results of the SSP, the AOC may be recommended for No Further Action (NOFA). If the AOC requires further action, one of the following options will be selected:

- Interim Removal Action and confirmation sampling to demonstrate that risks are reduced to acceptable levels
- Focused Site Investigation, including additional sampling
- Remedial Investigation/Feasibility Study

If the EPA determines that an AOC is a Source Area, then the site remediation will follow the CERCLA guidance and regulations.

(*Site Screening Process*, ARF 01-13-080 F)

## 7 Source Areas and Areas of Concern

This section summarizes past, present and future activities at each site. Prior to 2001, the Site Management Plan identified sites within FNOD as Source Areas, Removal Action Areas or Areas of Concern. The FY 2002 SMP, and subsequent versions, identifies sites as either Source Areas (S-XX) or AOCs (A-XX) and an Operable Units (OU-XX) or Possible Operable Units (POU-XX). The following sections identify the location and size of each site and summarizes the site history (including the information which prompted the site's identification as an AOC or SA), past and present activities, and the current fiscal year plan.

Tasks required for each phase of site work will be approved by Project Delivery Team members. Briefly, investigation of SAs will continue following the CERCLA process as outlined in Figure 7.1 and the Clean-Up Master Flow Chart for FNOD (Figure 7.2). The Clean-Up Master Flow Chart indicates the status of each site – completed work, ongoing activities and projected tasks. This chart assumes a worst-case scenario in which at least one AOC in each group proceeds to cleanup under CERCLA. This chart is revised each year as investigations proceed. Table 7.1, the OU Planner, provides the groupings of SAs and AOCs with the FUDSMIS (Formerly Used Defense Site Management Information System) project number and Cost to Complete (CTC) programming requirements codes. SA and AOC groupings can change based on the current understanding of present risk and changes in major stakeholder requirements.

To determine if an AOC must undergo the CERCLA process, it will be screened in accordance with the SSP.

Following Section 7 is a section on other relevant investigations and activities. The Project Delivery Team may propose that a site be elevated to an AOC should additional information indicate the need to conduct further investigation.

Figure 7-1 - CERCLA Process

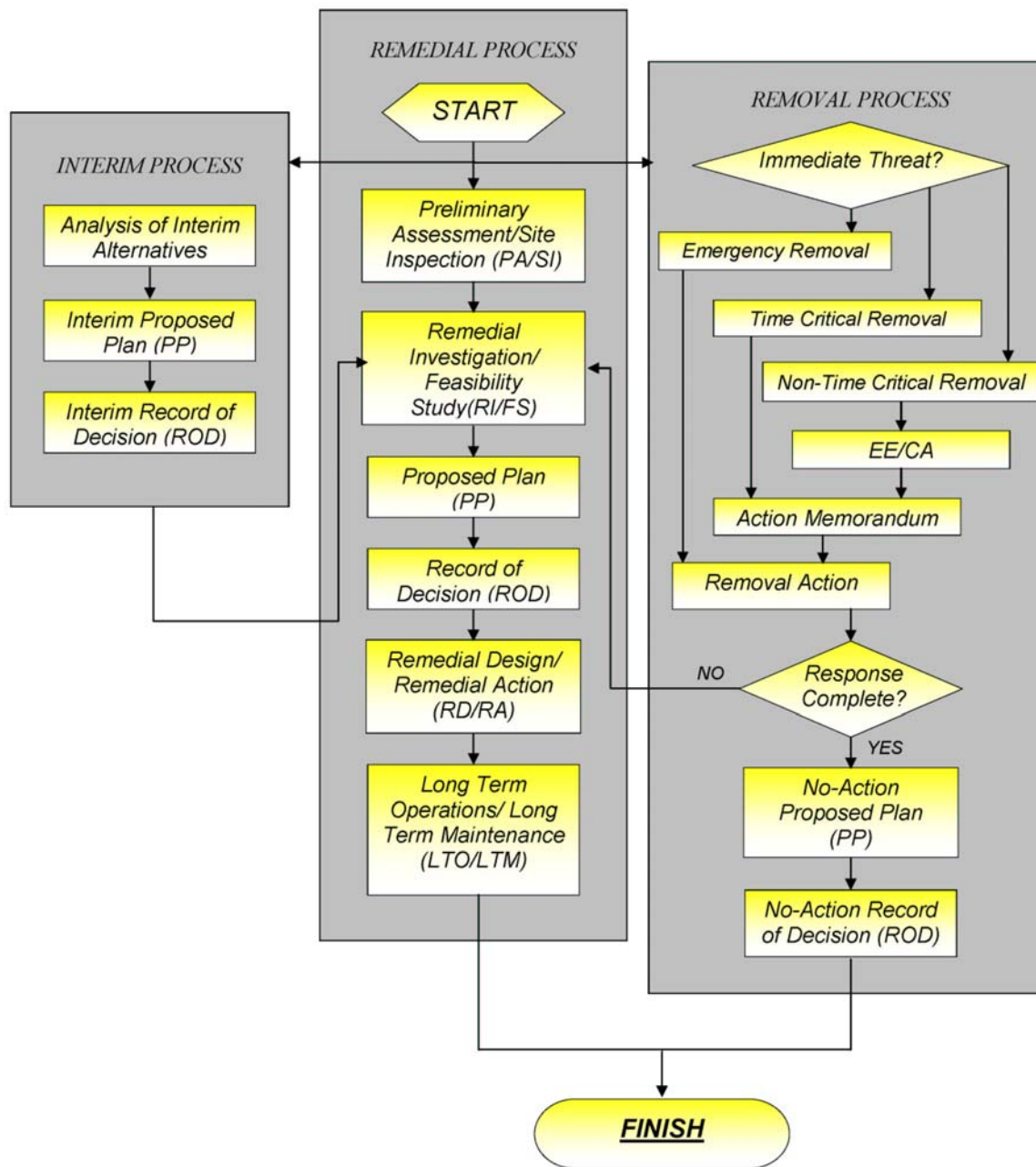


Table 7.1 - CERCLA Clean-Up Master Flow Chart

Table 7.1 FNOD CERCLA CLEAN-UP MASTER FLOW CHART																																								
	OE-1		OU-5		OU-7		OU-4		OU-1		POU-8		OU-2		OU-3		OU-6				POU-9 GROUP B AOCs					POU-10		POU-11	OTHER AREAS OF CONCERN											
CALENDAR YEAR	OE REMOVAL ACTIONS		TNT AREA		IMPREGNITE KIT AREA		TRACK K DUMP (TIRE PILE AND PAINT CANS)		JAMES RIVER BEACH FRONT (JRB)		NANSEMOND RIVER BEACHFRONT (NRB)		MAIN BURNING GROUND (MPG)		HORSE-SHOE POND (HSP)		OFF SHORE STUDY	NEAR SHORE STUDY	NEAR SHORE NRB / HSP	INLAND LAKES		AOC 10 Track G E	AOC 11 Track H & I	AOC 12 TRACK J	AOC 20 ABANDONED WATER TREATMENT PLANT	GE POND NANSEMOND CULVERT	GROUP C AOCs		GROUP D AOCs	PESTICIDE DRUM AREA	RODS									
1998	EE/CA		RI																																					
1999	RA		RI																																					
2000	RA		RI										RI		RI		SLERA																							
2001	RA		RI				EE/CA IRA		EE/CA IRA		EE/CA IRA		RI		RI		SLERA	SI																						
2002	RA		RI				EE/CA IRA		RI		SSP		RI		RI		BERA	SI																						
2003	RA		RI		P-DELIST [NOIPD]		RI		RI		SSP		RI		RI		HHRA	BERA HHRA	BERA HHRA	SSP		SSP	SSP							SI	0									
2004	RA		RI				RI		RI		OE SSP		RI		RI		ROD RA COMP [RA REPT]	BERA HHRA	NRB *HSP DATA	SI		SI	SI	SSP	SSP	SSP	SSP			SI	1									
2005	RA		RI				FS		RI		RI		RI		RI		P-DELIST [NOIPD]	RI	RI	RI		RI/FS	RI/FS	SI	SI	SSP CLOSE OUT REPT	SI		SSP	EECA	0									
2006	RA		FS				ROD		FS		FS		RI		FS			ROD	FS	FS		ROD	ROD	RI/FS				RI/FS		SI	ROD	5								
2007	ROD RA COMP [RA REPT]		ROD				P-DELIST [NOIPD]		ROD		ROD		FS		ROD			P-DELIST [NOIPD]	ROD	ROD		RD/RA	RD/RA	ROD				ROD		RI/FS	P-DELIST [NOIPD]	9								
2008	CLOSE OUT REPORT		RD/RA RA COMP (RA REPT)						LTO/LTM		LTO/LTM		FS		RD/RA RA COMP (RA REPT)					LTO/LTM	RD/RA	RA COMP [RA REPT]	RA COMP [RA REPT]	RD/RA				RD/RA		ROD		1								
2009			LTO/LTM						LTO/LTM		LTO/LTM		ROD		LTO/LTM				5 YEAR REVIEW	RA COMP [RA REPT]		P-DELIST [NOIPD]	P-DELIST [NOIPD]	RA COMP [RA REPT]				RA COMP [RA REPT]		RD/RA		1								
2010			5 YEAR REVIEW						LTO/LTM		5 YEAR REVIEW		RD/RA RA COMP (RA REPT)		5 YEAR REVIEW				P-DELIST [NOIPD]	P-DELIST [NOIPD]				P-DELIST [NOIPD]				P-DELIST [NOIPD]		RA COMP [RA REPT]		0								
2011			P-DELIST [NOIPD]						5 YEAR REVIEW		P-DELIST [NOIPD]		LTO/LTM		P-DELIST [NOIPD]	<div>LEGEND</div> <div><div>STUDIES</div><div>DECISIONS/CLEAN UP</div><div>LTO/LTM</div><div>DELIST/CLOSE OUT</div></div>																						CONST COMP [FCOR]		0
2012									P-DELIST [NOIPD]				LTO/LTM																			SITE COMP [FCOR]		0						
2013													5 YEAR REVIEW																			DELIST [NOID]		0						
2014													P-DELIST [NOIPD]																											

AS OF 10 DEC 2003



Table 7-2 - OU Planner

FNOD SITE - PROJECT	Source Area / AOC	FUDSMIS PROJ	FY01 FUDSMIS	FUDSMIS
MEC		2	975 acre MEC	975 acre MEC
MEC Land Use Controls		2	975 acre MEC	975 acre MEC
TNT Disposal Area	1	1	TNT Area	OU-5 TNT Area
James River Beachfront	2	9	975 Acre HTW	OU-1 JRB Area
TCE Contamination	AOC 19	9	976 Acre HTW	OU-1 JRB Area
Impregnite Kit Area	3	4	975 Acre HTW	OU-7IKA
Horseshoe Pond	4	5	HSP	OU-3 HSP
GE Burning Ground	5	6	MBG	OU-2 MBG
Track K Dump	6	10	975 Acre HTW	OU-4 TKD
Pesticide Drum Area		10	975 Acre HTW	OU-4 TKD
Nansemond River BF	AOC 1	15	975 Acre HTW	POU-8 NRB
Abandoned Structures	AOC 13	15		POU-8 NRB
Hydrologic CSM		3	975 Acre HTW	975 Acre HTW
Streeter Creek	AOC 2	11	975 Acre HTW	OU-6 Off Shore, GP A AOCs
Off Shore Area (far)	AOC 3a	11	975 Acre HTW	OU-6 Off Shore, GP A AOCs
Off Shore Area (near)	AOC 3b	11	975 Acre HTW	OU-6 Off Shore, GP A AOCs
Area J Lake	AOC 7	11	975 Acre HTW	OU-6 Off Shore, GP A AOCs
TCC Lake	AOC 5	11	975 Acre HTW	OU-6 Off Shore, GP A AOCs
Track G Line Scars	AOC 10	12	975 Acre HTW	POU-9 GP B AOCs
Track Hand I Line Scars	AOC 11	12	975 Acre HTW	POU-9 GP B AOCs
Abandoned Water TP	AOC 20	12	975 Acre HTW	POU-9 GP B AOCs
Marine Cops Pwr Gen	AOC 6	12	975 Acre HTW	POU-9 GP B AOCs
Track J Line Scars	AOC 12	12	975 Acre HTW	POU-9 GP B AOCs
Track K Line Scars	AOC 14	13	975 Acre HTW	POU-10 GP C AOCs
Track K Land Fill	AOC 15	13	975 Acre HTW	POU-10 GP C AOCs
Suspected USTs	AOC 18	13	975 Acre HTW	POU-10 GP C AOCs
Removed Steam Plant	AOC 16	13	975 Acre HTW	POU-10 GP C AOCs
PCB Transformers	AOC 17	14	975 Acre HTW	POU-11 GP D AOCs
Track A and B Burn Gnd	AOC 9	14	975 Acre HTW	POU-11 GP D AOCs
Track A Disposal Pit	AOC 8	14	975 Acre HTW	POU-11 GP D AOCs
Officer's Club Pool	AOC 21		975 Acre HTW	NOFA

## S-1 TNT Source Area

[OU-5]

Size: The TNT Source Area is approximately 9.8 acres in size.

Location: The TNT SA is located on TCC property at the intersection of College Drive and Jamestown Road.

History and Past Work: The TNT Area was identified in 1987 when evidence of munitions debris was found. The original work area was approximately 1.87 acres in size and enclosed by a fence. Subsequent investigation in the fenced area revealed a slab of crystalline TNT weighing several tons. Multiple remediation activities, as well as several rounds of soil and groundwater testing, have been conducted in the original TNT Area since the initial MEC find. The final boundaries of the TNT SA were established after evaluating historical aerial photographs and identifying suspicious topography (changes in elevation and disturbed areas) north of the original removal site. (*Archives Search Report*, ARF 01-13-066 F)

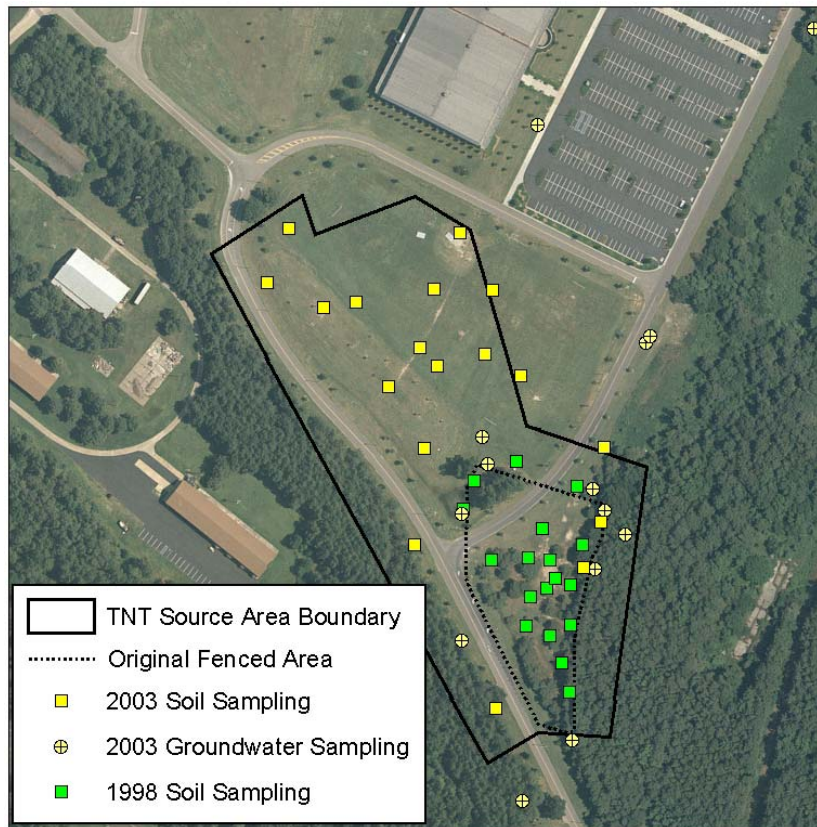
- In May of 1987, an MEC surface sweep was conducted. 10 lbs. of high explosives (TNT base), 170 lbs. of ordnance related material, and 400 lbs of scrap metal were collected and disposed of off-site. (*Appendix IX, Memorandum dated 15 May 1987*, ARF 01-12-001 F)
- During June and July 1987, a Remedial Action Investigation and Ordnance Survey was conducted. The investigation included a geophysical survey, test excavations, installation of monitoring wells (MWs), soil sampling and groundwater sampling. MEC was discovered in six out of 15 test excavations and included hundreds of 30 & 45 caliber rifle ammunition, explosive boosters, 100 to 150 cubic feet of crystalline TNT, scrap metal, burned out tear gas canisters, and fuses. Soil samples were collected from all 15 test pits and groundwater was collected from the MWs. Several CoCs were detected in the soil and groundwater. (*Engineering Report Groundwater Contamination*, ARF 01-12-001 F & *Engineering Report Ordnance Survey*, ARF 01-01-002 F)
- In December 1988, a surface and subsurface MEC clearance was conducted. MEC was removed from several of the previously identified pits as well as newly discovered pits. Contaminated soil was packaged and left on site for future disposal. A total of approximately 5,500 lbs of MEC was removed for the site. (*Final Report*, ARF 01-01-004)
- The contaminated soil left on site in 1988 was sifted to segregate hazardous and non-hazardous materials. The MEC was packaged and left on site. Part of the contaminated soil was returned to a lined pit and the remainder was packaged and left on site. (*Addendum to Final Report*, ARF 01-01-004)

- Between November 1989 and February 1991, an investigation (to be included in the 1992 Final Remedial Investigation (RI) for the TNT Area) was conducted to determine the physical characteristics of the site, define the extent of contamination, and assess potential pathways for contaminant migration. A total of thirty-five boring, ten surface, and 5 monitoring well boring soil samples were collected. Five new MWs were installed and groundwater from all 12 wells was tested. Several CoCs were detected in the soil and groundwater. (*Final RI*, ARF 01-13-031 #7)
- From April through June 1992, packaged, contaminated soil left on site after the 1988 and 1989 MEC investigations, as well as six inches of additional soil beneath the bags, was screened. The soil in the plastic-lined pit was removed along with 12 inches of soil beneath the liner and soil from adjacent drainage areas. The soil was screened and all MEC and contaminated soil were disposed of off-site. Confirmatory soil samples were collected from all excavations and of the CoCs present, concentrations were below regulatory limits. Approximately 435 tons of clean soil was used to backfill the excavations. A total of 316 tons of contaminated soil, 2800 gallons of non-hazardous water and 20 cubic yards of non-hazardous debris were removed and disposed of off-site. (*Contaminated Soil Removal*, ARF 01-13-070 F)
- In August 1994, five new MWs were installed, two existing wells were abandoned and one well was replaced. Monitoring well soil borings and groundwater were sampled. CoCs were detected in the groundwater. (*Groundwater RI*, ARF 01-05-004)
- During November 1998, soil samples were collected from 18 locations inside the original fenced area. CoCs were detected in several samples. (*Daily Report*, ARF 01-01-046)
- In May 1999, the Norfolk District entered into an IAG to perform a Time Critical Removal Action (TCRA) at several locations within FNOD, including the TNT SA. As a result of the IAG, a geophysical survey was conducted in July 1999 and several magnetic anomalies were discovered. (*Interagency Agreement*, ARF 01-08-005 & *Final Field Report*, ARF 01-01-048)
- From January 2000 until April 2001, an MEC removal was conducted based on the targets identified during the 1999 geophysical survey. Several pits in the TNT Area yielded assorted MEC, scrap metal, creosote and miscellaneous non-MEC waste (pipe, bricks, marsh matting, utility pole). All items were removed and disposed of off-site. Additionally, twenty-five, 100-foot square grids in the TNT Area were investigated. Twenty tons of non-MEC scrap and 2 lbs. of MEC scrap were removed, in addition to adaptor boosters, fuses, TNT bags, raw TNT, small arms and rifle grenades. Solid TNT was discovered approximately 6 feet under ground and left in place until the MEC investigation was complete. (*Final Report MEC Removal*, ARF 01-13-094)

- During March and April 2003, soil and groundwater sampling was conducted to determine the extent of contamination between the perimeter of the original fenced area and the TNT SA boundary. Soil samples were collected at 18 locations and groundwater was collected from 14 MWs in and around the SA. (*Technical Evaluation*, ARF 01-13-107 v1)
- In June 2003, solid TNT, discovered during the earlier grid investigations, was excavated, and approximately 500 pounds of TNT was removed. The soil overlying the TNT was tested using the Toxicity Characteristics Leachate Procedure (TCLP). Several compounds exceeded TCLP regulatory limits, resulting in the soil being classified as hazardous waste. However, the soil surrounding the excavation was known to be equally contaminated. As a temporary solution, the excavation was lined and the soil returned to the pit.
- A Time Critical Removal Action Memorandum was implemented to address the contaminated soil left in place after the June 2003 removal. The TCRA resulted in a temporary cap, which consisted of a 6-inch deep layer of topsoil placed over a geofabric. The temporary cap is intended to protect human health and the environment until the RI/FS is completed. (*Draft Action Memorandum dated 15 October 2003*, ARF 04-02-005)
- The 1998 and 2003 analytical results were validated for use in the Human Health and Ecological Risk Assessments, which are currently being conducted.

Future Work: The MEC investigation at the TNT Source Area is complete. The TCRA Final Report will be issued in FY05 after MEC investigations at the remainder of the TCRA areas are concluded (Section 8 – Time Critical Removal Action). The validated analytical results and RA will be incorporated into a draft RI report, scheduled for release in FY05. After regulatory review, the RI will be finalized and used as the basis of a Feasibility Study, tentatively scheduled for FY05.

## TNT Source Area - 2003 Soil and Groundwater Sampling Locations



## S-2 James River Beachfront

[OU-1]

Size: The James River Beachfront (JRB) SA is approximately 14 acres in size.

Location: The JRB is located on the south bank of the James River on the TCC property directly west of the Interstate 664 Monitor Merrimac Memorial Bridge-Tunnel.

History and Past Work: The JRB is identified as Source Area 2 in the Final HRS Package. The site is an approximately 500-foot section of shoreline that sharply transitions into a bluff. It was used as a general disposal site during World War I. Prior to a removal action during the summer of 2001, the bluff eroded significantly, exposing large amounts of debris – scrap metal, concrete slabs, bricks and other construction debris. Presently, the bluff is covered with grass and is stabilized by a stone revetment. At the base of the revetment, a sandy beach gently slopes to the water line. (*Archives Search Report*, ARF 01-13-006 F)

- USACE St. Louis District performed a visual inspection in November 1993 and found construction debris, concrete, bricks, water and sewer pipes, six inert 170 mm German artillery rounds, three inert artillery fuses, and containers of various sizes similar to chemical agent storage and transport containers. The materials were found on the beach and protruding from the bluff. (*Archives Search Report*, ARF 01-13-006 F)
- Roy F. Weston (Weston) conducted a removal assessment for EPA Region III in November and December 1995. Ordnance was examined for potential hazards; soil was field screened for Explosives; soil was analyzed for BNA, Explosives, TAL & TCLP Metals and Asbestos; a geophysical survey was performed to delineate the disposal area; and a surface clearance and subsurface survey were conducted by Navy Explosive Ordnance Disposal (EOD). (*Final Report Nansemond Ordnance Depot Site Removal Assessment*, ARF 01-13-012 F)
- Foster Wheeler conducted site visits, in conjunction with an Engineering Evaluation/Cost Analysis (EE/CA), in November 1993, December 1993 and January 1996. Building and civilian debris, 170 mm German artillery rounds and rusted containers were observed. Geophysical and Unexploded Ordnance (UXO) investigations indicated the presence of “extensive disposal areas containing metallic debris.” Foster Wheeler recommended surface MEC clearance and Institutional Controls followed by periodic surface sweeps. (*Final EE/CA*, ARF 01-04-012-F)
- During a June 1996 site reconnaissance the previously observed debris was still present. Additionally, small canisters were discovered. The canisters appeared to be conglomerated by burning and were labeled "Explosive Danger." (*Trip Report*, ARF 01-02-002)
- The Norfolk District installed a chain-link fence around the beachfront area in 1996 and repaired the fence in 1999 and 2000.

- USACE Baltimore District conducted an SI in 1998. Soil and groundwater sampling was performed to determine the presence (and levels), or absence, of contamination and provide recommendations for remedial action. Contaminants of Potential Concern (COPCs) were identified in the subsurface soil, surface soil, and groundwater. Furthermore, Trichloroethene (TCE) was detected in upgradient Background Wells at levels exceeding the Maximum Contaminant Level (MCL) and Tapwater RBC screening criteria. Based on current and future use of the JRB, Baltimore District recommended closing the landfill in place and installing permanent shoreline stabilization. They also indicated the need for further investigation of the TCE contamination, which is discussed in section A-19. (*Final Site Investigation Report*, ARF 01-13-027-F)
- Weston, for Baltimore District, developed risk-based remedial (cleanup) goals (RGs) and the method for demonstrating compliance with the RGs through confirmation sampling. (*Risk Based Cleanup Criteria*, ARF 01-13-063-F)
- In May of 1998, human bones were unearthed during construction of an access road. The bones were determined to be more than 100 years old. In August 2000, Norfolk District conducted a phase I and II level archaeological test in the vicinity of the human burial. Artifacts dating from the late 1800's to the early 1900's were recovered and the site was formerly designated number 44SK481. No other human burials were found and the project archaeologist recommended no further work be conducted at the site other than removing the original human remains. The Virginia Department of Historic Resources issued a permit to remove the burial on 4 June 2001. The remains were removed during June of 2001 and re-interred at an alternate location. (*Result of Excavation*, ARF 06-01-035)
- A removal action was completed during the summer of 2001. Debris was removed, confirmatory geophysics was performed, anomalies were located and removed, confirmatory samples were collected and a stone revetment was constructed. The remedial goals were met for the beachfront and shoreline subunits. The RGs for protection of human health were met for the upland bluff subunit, but RGs for ecological receptors were not met. Therefore, an additional 30-foot by 90-foot area of the upland bluff was excavated to a depth of 2 feet and replaced with off-site fill material. MEC items found and removed included several 170 mm German projectiles, one 8-inch projectile and a cannon ball, none of which were fused or contained explosives. (*Removal Operation Final Technical Report*, ARF 01-13-082 F).
- In early June 2003, a geophysical survey of the JRB nearshore was conducted, as part of the Environmental Characterization study, to detect submerged anomalies. This information was used to suggest locations for sediment coring. A follow-up survey was conducted in February 2004 to assess the nearshore after hurricane Isabel and update the coring locations, as needed. (*Survey Report*, ARF 01-13-118)
- During June 2004, twelve sediment cores, up to 10 feet in length, were collected from the JRB nearshore and submitted for chemistry and toxicity analyses. Results will be

presented in the Geophysical Report (completion date – early FY05). (*Field Report*, 04-01-012.10)

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Future Work: A contract was awarded for the onshore Human Health and Ecological Risk Assessments, which will be conducted during FY05. The RA will be incorporated into the RI Report in order determine the remedial action required at the site.



### S-3 Impregnite Kit Area

[OU-7]

Size: The Impregnite Kit SA originally encompassed a rectangular area approximately 7 acres in size. Subsequent activities resulted in the Project Delivery Team agreeing to reduce the area to a 1.66-acre circle, approximately 207 feet in diameter. (*Meeting Minutes dated 9 May 2002*, ARF 04-01-010)

Location: The Impregnite Kit SA is located south of the GE Plant on Dominion Lands property in a partially wooded area.

History and Past Work: This SA was a disposal area for Impregnite Kits. The kits contained XXCC3 and an inert, viscous liquid. XXCC3 is a compound used to neutralize chemical agents, and the kits were likely used as a protective coating on undergarments for military issue chemical suits. (*Final HRS Package*, ARF 01-13-031) These kits are not considered a Resource Conservation and Recovery Act (RCRA) Hazardous Waste as defined by the Material Safety Data Sheets.

- In March 1996, Malcolm Pirnie, for Dominion Lands, conducted an environmental screening of several parcels, including the Impregnite Kit SA. The screening consisted of a visual inspection, an MEC investigation and soil sampling. Excavation uncovered wooden crates, small metal cans and fiber drums. Labels identified containers found in the crates as Impregnite Kits. Surface and subsurface soil samples were collected. (*Environmental Screening Investigation*, ARF 01-13-013)
- Both Weston and Gannett Fleming conducted soil and waste sampling in February 1997. (*Final HRS Package, References 24 & 32*, ARF 01-13-031)
- In December 1998, 860 tons of Impregnite Kit materials and soil were removed and transported to a solid waste landfill. (*Final Remediation Report*, ARF 01-12-002 F)
- In July 1999, a confirmation geophysical investigation was performed and confirmation soil samples were collected. 16 magnetic anomalies were identified during the geophysical survey. One magnetic anomaly (Anomaly 1) was not investigated due to its large size. The remainder of the anomalies consisted of rebar, wire, pipes and miscellaneous ferrous items. One soil sample adjacent to the Horseshoe Pond (HSP) SA contained Arsenic at a level exceeding screening criteria; however, the HSP SA was expanded to incorporate this soil sampling location, and it will be investigated in conjunction with the HSP. The remaining confirmation soil samples indicated that no further cleanup actions were required. (*Meeting Minutes dated 6 December 2001*, ARF 10-01-001 & *Confirmation Sampling Report*, ARF 01-01-049)
- In August 2002, Anomaly 1 was investigated and found to contain approximately 10 pounds of non-MEC scrap and one item of MEC scrap. (*Weekly Report*, 4 – 10 August 2002, Zapata Engineering)

- In October 2002 the confirmatory soil sample results were validated, and it was recommended that No Further Action was required for soil in the Impregnite Kit SA. Furthermore, it was discovered that the Arsenic level thought to exceed screening criteria, and added to the HSP SA, was a matrix spike result and not the primary sample result. (*Post Removal Action Confirmatory Sampling Report*, ARF 01-13-101)
- On 20 March 2003, the EPA Region III issued a Notice of Intent for Partial Deletion stating  

"The portion of the site to be deleted from the NPL is the soil in the Impregnation Kit Area... Only soil in this area is being deleted from the NPL; ground water beneath the Impregnation Kit Area will not be deleted at this time.  
A notice of intent to delete this portion of the site was published January 21, 2003 (68 FR 2726). The closing date for comments on the notice of intent to delete was February 20, 2003. EPA received no comments." (*Partial Deletion Docket*, ARF 01-13-106)

Future Work: Investigation into possible groundwater contamination is ongoing in order to determine if further groundwater remediation is required at the site.

## S-4 Horseshoe Pond

[OU-3]

Size: The Horseshoe Pond SA is approximately 1.2 acres in size.

Location: The HSP is located on Dominion Lands southwest of the GE Plant and adjacent to the Nansemond River.

History and Past Work: The HSP is a pond surrounded by berms and steep banks. It was apparently used as a waste disposal area for approximately 10 years beginning in the late 1940's. Laboratory glassware, bottles, film, and assorted debris are visible in the vicinity of the pond. (*Final HRS Package*, AFR 01-13-031) Unconfirmed information suggests that a Pistol and Small Bore Range covered an area, approximately 400 feet by 600 feet, on the southeastern arm of the HSP and overlapped the water. This SA contains wetlands that preclude development.

- During a June 1996 site reconnaissance, the glassware, film and other debris was observed. Also, a geophysical survey was conducted in 1996 over a 30-meter by 30-meter grid at the north end of the HSP. Twenty-four of the 36 detected anomalies were investigated and none were found to be MEC-related. However, two M-18 smoke grenades were found on the surface. (*Trip Report*, ARF 01-02-002 & *Final EE/CA*, ARF 01-04-007 F)
- In February 1997, Weston, for EPA Region III, collected soil, sediment and surface water samples and sampled probable waste sources in the drainage system. (*Draft Remedial Investigation Report*, ARF 01-05-008)
- Between November 1999 and April 2000, an initial RI was conducted at the HSP, Main Burning Ground and Steamout Pond AOCs. The initial RI included sampling of soil, sediment, surface water and shallow groundwater and a limited geophysical investigation. The draft RI Report identified several data gaps. (*Revised Draft RI Report*, ARF 01-05-008)
- In August 2002, Anomaly 1, originally part of the Impregnite Kit Area and added to the HSP SA, was investigated and found to contain approximately 10 pounds of non-MEC scrap and one item of MEC scrap. (*Weekly Report*, 4 – 10 August 2002, Zapata Engineering)
- During the Impregnite Kit confirmatory sampling data validation process, it was discovered that the Arsenic level thought to exceed screening criteria, and added to the HSP SA for further investigation, was a matrix spike result and not the primary sample result. (*Post Removal Action Confirmatory Sampling Report*, ARF 01-13-101)
- A Supplement to the RI addressing the RI data gaps was completed in 2003. The SRI included an expanded geophysical investigation of previously inaccessible areas of the HSP, investigation of test pits, and additional surface and vadose zone sampling. A Revised Draft RI Report, including validated analytical results and a Baseline Human Health Risk Assessment, was issued in July 2003. (*Supplement to the*

*Remedial Investigation Report, ARF 01-05-009 and Revised Draft RI Report, ARF 01-05-008)*

- Soil collected from the berm and tidal marsh sediment were evaluated to determine if a pathway exists between the HSP and nearshore area adjacent to the Nansemond River; however, the evidence was inconclusive. (*Technical Memo, ARF 01-05-010*)
- During the SRI field investigation, two significant subsurface anomalies, one having a ferrous component, were discovered in the HSP. In order to access the anomalies for further investigation, the HSP must be dewatered. Surface water sampling was conducted in July 2004 in order to determine the appropriate method for handling the water when the pond is drained for the anomaly investigation.
- The Human Health Risk Assessment was completed in FY04.
- A Baseline Ecological Risk Assessment is currently underway in order to determine if a pathway exists between the HSP and the nearshore area.

Future Work: The Ecological RA will be completed in FY05.

## S-5 Main Burning Ground and Steamout Pond

[OU-2]

Size: The Main Burning Ground (MBG) is approximately 32 acres. The Steamout Pond (SP) is located in the Main Burning Ground and is approximately 1 acre.

Location: The MBG is located in the eastern half of FNOD on GE Property. It is southeast of the GE Pond and south of Wellner (formerly Park) Drive.

History and Past Work: The MBG appeared active from at least 1942 until the late 1950's, first as a burning ground or test area, then as a waste disposal area. The MBG was characterized by ground scars, mounded material, pits, trenches, equipment, and a small structure. The Steamout Pond first appeared as an excavation in the eastern half of the MBG in 1952. Access roads and trenches led to the Steamout Pond. In 1958, it was filled with a dark liquid and fed by a ditch containing a similar liquid. By 1963, the area appeared inactive and was becoming re-vegetated. Currently, the MBG is partially wooded and the SP, while smaller than it's original size, remains visible and is lined with a black, tar-like material. (*Site Analysis Report*, ARF 01-01-003 & ARF 05-01-003; *Historical Photo Analysis*, ARF 05-01-005)

- In conjunction with the EE/CA issued in 1998, a geophysical survey, test pits, and soil sampling were completed at the MBG & SP. Trenches were identified and MEC, MEC related items, and burn layers were discovered. (*Final EE/CA*, ARF 01-04-007-F)
- In February 1997, Weston and Gannett Fleming, representing EPA Region III, collected soil, sediment and water samples from the MBG and SP. (*Site Sampling Plan*, February 1997, ARF 02-03-020 and *Analytical Report*, April 1997, ARF 07-02-033; *Revised Draft RI Report*, ARF 01-05-008)
- An MEC investigation and removal action began in February 2000. During incineration, MEC may have been propelled some distance beyond the MBG boundary when explosions occurred. Therefore, the boundaries for the MEC investigation were extended beyond the MBG in order to include this "kick-out" area (two additional parcels designated Dominion Lands I and Dominion Lands II located southeast and south of the MBG, respectively). The Dominion Lands I & II clearances are complete. Approximately ½ of the MBG grids are complete and the remainder of the work is ongoing. (*Final Report MEC Removal Action*, ARF 01-13-094)
- Between November 1999 and April 2000, an initial RI was conducted at the HSP, Main Burning Ground and Steamout Pond AOCs. The initial RI included sampling of soil, sediment, and water and a limited geophysical investigation. The draft RI Report identified several data gaps. (*Revised Draft RI Report*, ARF 01-05-008)
- A Supplement to the RI addressing the RI data gaps was completed in 2003. A Revised Draft RI Report, including validated analytical results and a Baseline Human Health RA, was issued in July 2003. (*Supplement to the Remedial Investigation*, ARF 01-05-009)

- Several Hazardous, Toxic and Radioactive Waste (HTRW) issues have arisen during the MEC investigation at the MBG. These issues are detailed in Section 8, Potential HTRW Issues.
- A Human Health Risk Assessment was completed in FY04.

Future Work: The MEC investigation and removal is ongoing. HTRW issues are being dealt with as they are discovered. Following the MEC investigation (anticipated completion date based on current funding levels - FY06), the RI will be finalized. Any outstanding HTRW issues will be addressed in the RI.

## S-6 Track K Dump (Tire Pile and Paint Can Area)

[OU-4]

Size: The Track K Dump SA consists of a Tire Pile and a Paint Cans. The Tire Pile is approximately 1/2 an acre in size (250 feet by 100 feet) and the Paint Cans cover a circular area approximately 12 feet in diameter.

Location: The Track K Dump is located west of South Road in an unused, wooded area of TCC.

History and Past Work: The Track K Dump was part of the Track K line of magazines and the tires and paint cans were piled on and around an old magazine foundation. The HRS Package states that, based on evaluation of historical aerial photographs, disposal of the tires and paint cans likely occurred between the mid-1970's and early 1990's when DOD no longer owned the property. However, the tires and paint cans were removed to access soil in the vicinity of the former K-6 magazine and investigate possible contamination. (*Final Work Plan*, ARF 02-01-018 F)

- In 1997, one soil sample was collected from the site and indicated the presence of CoCs at concentrations higher than nearby background concentrations. (*Final HRS Package*, ARF 01-13-031)
- In April 2001, HydroGeoLogic, Inc. was contracted to survey the tire pile and paint can locations, conduct a removal operation, collect post-removal confirmatory sampling, and apply the SSP to the samples results. (*Final Work Plan*, ARF 02-01-018 F)
- A removal operation was conducted during May and June of 2001. Prior to the removal action, an MEC surface sweep was conducted and the area was found safe. The following items were removed and disposed of in a local landfill - approximately 60 tons of tires; six rusted, 1-gallon, empty paint cans; appliances; household waste and construction debris. (*Summary of Tire Pile Removal*, ARF 01-13-076) Five confirmatory soil samples were collected from the tire pile area and from the paint can area, and several CoCs were identified. Based on the confirmatory soil sample results, background information and nature of waste found at the Track K Dump, groundwater contamination is considered unlikely and will not be investigated. (*Interim SSP Report*, ARF 01-013-110 v1)
- In February 2002, additional surface and subsurface soil sampling was performed to further characterize the nature and extent of contamination. (*Interim SSP Report*, ARF 01-013-110 v1 and *Data Validation Report*, ARF 07-01-013)
- In March 2002, a representative from the Virginia Department of Environmental Quality inspected the Track K Dump and certified that the tire pile clean up complied with stated regulations. (*Letter, dated 8 April 2002*, ARF 04-01-010)
- Delineation soil samples were collected in 2004 and the analytical results were validated.

- A remedial investigation is being performed to evaluate the risk to human health and the environment.

Future Work: Future work will be dictated by the results of the RI.



## A-1 Nansemond River Beachfront

[POU-8]

Size: The Nansemond River Beachfront (NRB) AOC is approximately  $\frac{1}{4}$  of an acre in size.

Location: The NRB is located northwest of GE along the Nansemond River on TCC property. It includes a beach and rocky bluff approximately 150 feet in length.

History and Past Work: The NRB was listed as an AOC due to the presence of metal slag of questionable content. Evaluation of aerial photos indicates evidence of ground disturbance in the area, but the origin of the disturbance is unclear. The NRB is adjacent to several former depot structures including a Wastewater Treatment Plant.

- In October 1997, three soil samples were collected in conjunction with the EE/CA. TNT was detected in one sample. (*Final EE/CA*, ARF 01-04-012-F)
- In September 1999, the Norfolk District repaired a fence restricting access to the NRB. (*Memorandum dated September 1999*, ARF 04-01-007).
- Site visits conducted on 7 and 30 September 1999, in conjunction with a Desktop Audit of the NRB, revealed an eroded narrow shoreline stabilized with riprap. Debris found on the beachfront and protruding from the embankment included bricks, glass, ceramic items, asbestos siding, trash, steel rods, slag, ammunition rounds and an unidentified brown friable material. The majority of the items appeared to have been burned prior to disposal. (*Desktop Audit*, ARF 01-13-053 v1)
- In February of 2000, MicroPact and Gannett Fleming (representing Norfolk District and EPA Region III, respectively) sampled shallow subsurface soils, the brown friable material and slag. (*Technical Report*, ARF 01-13-111 v1)
- During April, May and June of 2000, Science Applications International Corporation (SAIC) conducted a 3-phase offshore investigation, which included a geophysical survey, sediment profile, and sediment sampling. Three sediment sample locations were in the proximity of the NRB, two being near potential onshore sources (HSP and GE Pond outfalls). (*Findings of an Environmental Survey*, ARF 01-01-055 F)
- During the summer of 2001 a removal operation was conducted at the NRB. Large stone and concrete rubble was moved aside to expose the underlying soil, which was excavated. Slag and metal debris were removed by hand. The soil was returned to the slope and the rubble replaced. Exposed sections of the beachfront were inspected and all the slag and metal debris was removed. Two weeks later, additional slag was sited under the concrete rubble. The rubble was moved and a one-foot-depth section of soil was excavated and disposed of in an off-site landfill. Confirmatory geophysics were conducted on the exposed section of the NRB. All anomalies were investigated and removed.

Prior to disposal, four samples were collected from the slag waste material and soil and analyzed for TCLP Metals. None exceeded the EPA regulatory limit for TCLP metals (40 CFR, 261.24, Toxicity Characteristic, Table 1, Maximum Concentration of

Contaminants for the Toxicity Characteristic) (*Removal Operation Final Technical Report*, ARF 01-13-082 F).

- On 15 and 22 August 2001, Gannett Fleming (for EPA Region III) conducted post-removal confirmatory soil sampling. Four surface soil samples were collected - two from an area under the former location of the brown friable material and two from an area under the removed rip rap where melted glass “vials” were discovered. (*Technical Report*, ARF 01-13-111 v1)
- In June 2003, during a routine inspection of the NRB, a British 6-inch shrapnel round was found. The round was not fused but contained a live (low explosive) expelling charge in the base. Zapata Engineering removed and disposed of the MEC. (*Technical Report*, ARF 01-13-111 v1)
- In July 2003 Reactives Management Corporation performed a clean up of surface slag, exposed as a result of the eroding shoreline. Excavation of the beach was not performed. Only clearly visible slag accessible without the use of heavy equipment was removed. Approximately 820 pounds of slag was collected, placed into heavy garbage bags, and transported to the Southeastern Public Service Authority bi-metals plant for recycling. Some slag remained visible in the bank on the west side of the concrete drain pipe. It appears that when that portion of the bank further erodes the slag will tumble onto the beach. (*Technical Report*, ARF 01-13-111 v1)
- Debris was discovered, spread over a large area, during FY04. Storms tore down some of the remaining bulkheads exposing the soil. Upon visual inspection by Zapata personnel, it appears that the soil behind the former bulkheads was taken from another location within FNOD and used as backfill during bulkhead construction.

Future Work: Due to the MEC discovery, the NRB is now considered an MEC site; therefore, an MEC investigation in the vicinity of the recovered MEC is scheduled for FY05. The Site Investigation Workplan is complete and the field work, to include a shoreline geophysical investigation and environmental sampling, is scheduled for FY05. The SI results will be evaluated in accordance with the SSP to assess the human health and ecological risk associated with the NRB and determine an appropriate course of remedial action at the site.

## A-2 Streeter Creek and Lakeview Drive Ground Scars

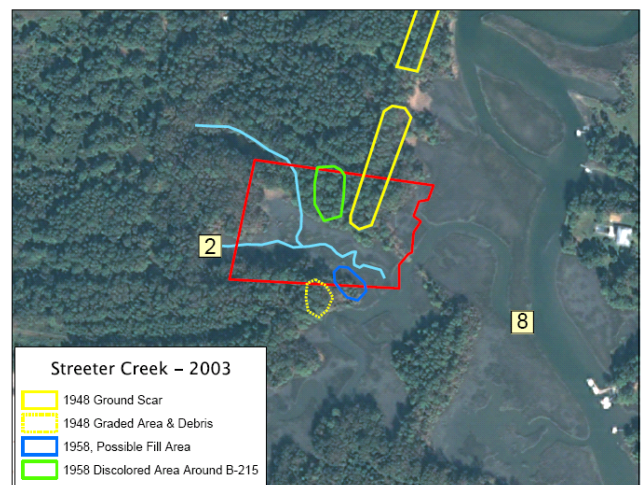
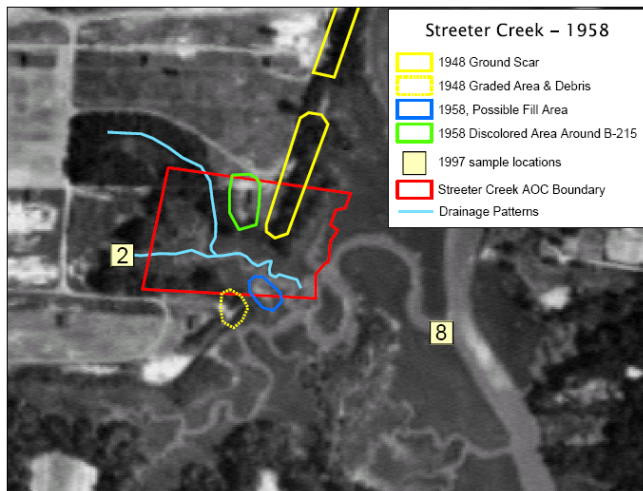
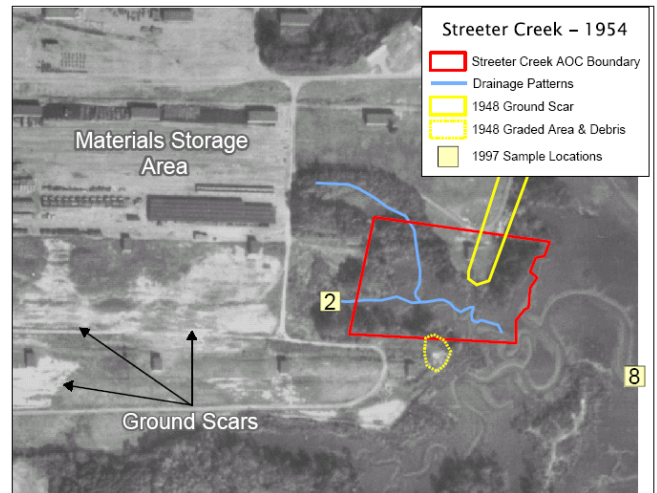
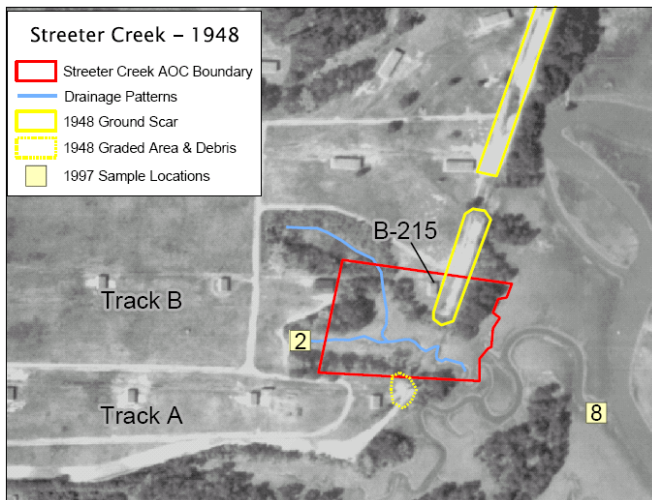
[OU-6]

Size: The Streeter Creek AOC is approximately 4.5 acres in size.

Location: The Streeter Creek AOC is located on TCC Property, along the eastern boundary of FNOD, between Interstate 664 and Streeter Creek, at the east end of former Tracks A & B.

History and Past Work: In 1948, a graded area and debris were identified just south of the AOC boundary, and a thin ground scar was observed near the western edge of the AOC. By 1954, a materials storage area was located northwest of the AOC and three large ground scars (Track A & B Burning Ground) were west of the AOC. In 1958, a possible fill area existed along the creek bank and a discolored area surrounded High Explosive Magazine B-215. Historical drainage patterns indicate that runoff from the materials storage area, ground scars and possible fill area entered the creek. (*Site Analysis Report*, ARF 01-01-003 & ARF 05-01-003 and *Desktop Audit*, ARF 01-13-058 F)

- In 1997, surface water and sediment samples were collected at two locations adjacent to the AOC and analyzed for VOCs, SVOCs, explosives, pesticides, PCBs, metals, and cyanide. Analytical results were validated and compared to Region III Residential Soil RBCs. Arsenic was detected in surface water (location 2) and sediment (locations 2 and 8) at concentrations exceeding the RBCs. Iron was detected in surface water (location 2) and sediment (location 8) at concentrations exceeding the RBCs. (*Analytical Report*, ARF 01-01-037)
- A site visit was conducted in July of 2000 and revealed dense patches of vegetation, two abandoned structures (former magazines) and debris (trash, construction debris, scrap metal). An unidentified structure (possible tank) was observed in the creek. Also, a hummocky area was located near the possible landfill seen in historical aerial photographs. (*Desktop Audit*, ARF 01-13-058 F)
- A Final Desktop Audit was issued in April 2002 and concluded that additional data was needed to fully characterize the site and develop a CSM. The DA recommended installing staff gauges and monitoring wells; sampling groundwater, surface water, and sediment; performing slug tests on the MWs; and measuring water elevations. (*Desktop Audit*, ARF 01-13-058 F)
- In September of 2001, Norfolk District and EPA Region III representatives, accompanied by Industrial Marine Services (IMS), investigated the unidentified structure in Streeter Creek. Baffles and I-beam construction observed inside the structure led to the conclusion that it was a pontoon (possibly a support for a bridge spanning the creek). Investigators determined the structure was of no concern and left it in place for future removal. (*Memo for the Record*, ARF 06-01-065)
- In the fall of 2002, in support of the CSM, staff gauges and MWs were installed. Also, groundwater and soil samples were collected. A preliminary draft of the CSM was submitted to the Norfolk District in early 2003 for review and comment. Presently, the CSM is undergoing a revision and will be issued in draft format during FY04.



**Future Work:** After investigating the contaminant sources, exposure pathways, and receptors identified in the CSM, an SI will be conducted and the AOC will be evaluated using the Site Screening Process.

## A-3 Nearshore and Offshore Areas

[OU-6]

Size: The FNOD shoreline is approximately 2 miles long. The Nearshore AOC is the area extending from the existing shoreline to the Mean Lower Low water mark (MLLW). The Offshore AOC is the area from MLLW out to approximately 1 mile.

Location: The Nearshore and Offshore AOCs are north and northwest of FNOD.

History and Past Work: Three piers are known to exist while FNOD was in operation. A railroad pier projecting north, approximately 4800 feet, is shown on a 1925 oblique photo. A 1942 aerial photograph shows two additional piers, a railroad pier approximately 500 feet long and a pier (unknown function) approximately 780 feet long. During World Wars I and II, the railroad piers were used to load unserviceable ammunition on barges for disposal at sea. By 1963 the longer railroad pier was completely submerged. (Archives Search Report, ARF 01-13-006 F; Historical Photo Analysis, ARF 05-01-005; *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003) Several known or suspected disposal areas and burn pits are located on or near the shoreline (Horseshoe Pond, Nansemond River Beachfront, James River Beachfront). Significant erosion of the shoreline, up to 300 feet in some areas, occurred over the past 50 years and exposed assorted debris, including MEC waste, metal, slag, and construction materials. (*Survey of the Marine Offshore Areas*, ARF 01-01-055 F) Unconfirmed information suggests that at least one fire occurred on the mile-long pier.

- Navy divers explored the area around the mile long pier pilings in 1999. No ordnance or hazardous items were discovered at that time (*Survey of the Marine Offshore Areas*, ARF 01-01-055 F)
- In September 2002, SAIC issued their findings of an environmental survey of the Offshore. The survey was conducted in three phases beginning with a geophysical investigation, followed by sediment profile photography, and concluding with sampling of surface and core sediments. The goal of the survey was to characterize the sediment that supports marine life and identify anomalous lithologies that may be a result of past FNOD activities. The Offshore Survey did not include the Nearshore Areas, Streeter Creek, TCC Lake or the 500-foot (fishing) pier. (*Survey of the Marine Offshore Areas*, ARF 01-01-055 F)
- In September 2002, SAIC issued a Baseline Ecological Risk Assessment (BERA) using the results of the Offshore Survey. The BERA concluded that ecological risk from the Offshore Area was negligible and requires no remediation or further action. (*Baseline Ecological Risk Assessment*, ARF 01-13-064 F)
- In June 2001, potential MEC items were located by VDOT personnel during a geophysical investigation of future bridge locations. Navy EOD divers discovered the search area covered with wood, metal and concrete debris; however, no MEC or MEC related items were recovered. (*After Action Report*, ARF 01-13-084)
- In February 2004, a Screening Level Ecological Risk Assessment (SLERA) was issued for the fishing pier area. The SLERA concluded that ecological risk from the fishing pier

area was negligible and requires no remediation or further action. (*SLERA*, ARF 01-13-112)

- During FY04, a Record of Decision for the Offshore Area, documenting that No Further Action is needed at the AOC, was approved by the EPA. (*Record of Decision for the Offshore Area*, ARF 01-13-120)

Future Work: The Nearshore field investigation is complete and upon receipt of final results, a Baseline Ecological Risk Assessment will be conducted.

## A-4 GE Pond and Culvert

[OU-6]

Size: The GE Pond is approximately 1 acre in size. The culvert is approximately 1700 feet in length.

Location: The GE Pond and Culvert are on General Electric property. The pond is located southeast of the main building and northwest of the MBG. The culvert begins at the northwest edge of the pond, travels north-, northwest under the parking lot and main building, and discharges into the Nansemond River just south of the NRB.

History and Past Work: The GE Pond was first observed on a 1931 aerial photograph as a shallow depression. By 1958, water filled the pond and it was connected to the Main Burning Ground by a suspected drainage structure. When GE purchased the property in 1966, the pond was functioning as a stormwater basin and would overflow and flood the parking lot during storm events. The culvert was constructed in the late 1960's to divert stormwater runoff from the pond. Stormwater overflow exits the pond through the culvert, which discharges directly to the Nansemond River. (*Draft Desktop Audit, October 2002, 01-13-108*)

- In February 1997, Weston, representing EPA Region III, collected sediment and water samples from the pond and culvert outfall. (*Site Sampling Plan, ARF 02-03-020 and Analytical Report, ARF 07-02-033*)
- GE contractor, Montgomery Watson Harza, collected sediment samples from the culvert outfall in December 2001. (*Sediment Results, ARF 07-02-032*)
- Surface water and sediment samples were collected in April and July of 2003. Surface water and sediment samples were collected from the pond, and sediment samples were collected from the suspected drainage structure leading from the MBG. The analytical results were validated and evaluated in accordance with the SSP. Based on the SSP criteria, the GE Pond surface water is not of concern as a source of contamination. Sediment in the pond and suspected drainage structure exceeded the screening criteria for some CoCs. All other CoCs were either not detected or detected at levels below the screening criteria. (*Draft Desktop Audit, October 2002, 01-13-108*)

Future Work: The Final SSP report for the GE Pond will be issued in FY05. A consensus letter, recommending that no further action is required at the AOC, will be submitted to regulators for approval

## A-5 Tidewater Community College Lake

[OU-6]

Size: TCC Lake is approximately 14 acres.

Location: TCC Lake is on TCC property west of Interstate 664 and adjacent to the James River.

History and Past Work: The TCC Lake AOC was originally a swampy creek draining into the James River. The lake was created when the creek was dammed and was a possible waste disposal area. (*Final HRS Package, Reference #33 - Data Acquisition Summary Report*, ARF 01-13-031) A water tank and pump house are located adjacent to the southeast bank of the lake. Several areas of debris (scrap metal, wood, glass, plastic bottles, household items, concrete) are located along the east side of the lake. Additionally, several pits, mounded areas, depressions and a possible man-made drainage feature are located on the east side of the lake. Eight explosives storage structures surrounded the lake while the depot was in operation (*Desktop Audit*, ARF 01-13-057). Paths leading through the woods from the Track K Ammunition Magazine Line and TCC Lake were observed in 1957. (*Historical Photo Analysis, March 1997*, 05-01-005) Analysis of past drainage patterns indicate that surface runoff entered the lake from the south and east. (*Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003).

- USACE performed a visual survey of the TCC Lake in November 1993. Construction debris was observed along the edge of the pond. An excavation, shored with railroad ties, was investigated on the east side of the pond; however, no debris or munitions were found. (*Archives Search Report*, ARF 01-13-006 F)
- An additional site reconnaissance was conducted in November of 1993. In addition to the items found earlier, more recently deposited debris (petroleum product containers) was found in one of the former magazines. (*EE/CA*, ARF 01-04-007 F)
- In November 1995, Weston, for EPA Region III, sampled soil from the excavation on the east edge of the lake and a trench near Track G, on the south side of the lake. (*Trip Report*, ARF 01-02-001)
- In January 1996, Gannett Fleming, for EPA Region III, conducted a site inspection; however, it was limited to a small area of the pond due to dense vegetation. (*Trip Report*, ARF 01-02-002)
- In February 1997, Weston, representing EPA Region III, collected sediment and surface water samples from TCC Lake. One CoC exceeded screening criteria. All other CoCs were either not detected or detected at levels below the screening criteria. (*Site Sampling Plan*, ARF 02-03-020 and *Analytical Report*, ARF 07-02-033)
- Gannett Fleming, for EPA Region III, conducted a multimedia sampling event from September through November 1997. Surface water, sediment and fish tissue were collected from the lake. (*Summary of EPA Sampling Efforts*, ARF 01-13-072)
- During 1997, a geophysical survey was conducted on the south side (Track G area), east side (ground scars between former K-6 & K-7 magazines) and northeast side (unidentified pits near former J-2 magazine) of TCC Lake. Magnetic anomalies



identified and investigated included steel pipe, metal rods, nails, bolts, wire, cans, wire fence, and other metallic debris. No potential UXO items were detected. Additionally, the lake bottom was surveyed by magnetometer and no anomalies were encountered. Soil from one of the pits surveyed on the northeast side of the lake was tested for Explosives and results were below the quantitation limit. (*EE/CA*, ARF 01-04-007 F)

- In March 2002 a Final DA was issued for the TCC Lake and identified several CoCs for further investigation. (*Desktop Audit*, ARF 01-13-057 F)
- VDEQ collected fish tissue and sediment samples in August 2000. The results indicated only low levels of contaminants commonly detected in fish tissue. After review by the Virginia Department of Health, it was concluded that the general public faces no health risks from consuming fish caught from TCC Lake. Also, the sediment was determined not to be a threat to aquatic life (*Fish Tissue and Sediment Results*, ARF 07-03-009).
- In early June 2003, SAIC performed a geophysical survey of the TCC Lake in support of the Environmental Characterization study. The survey revealed the presence of large metal objects, believed to be debris, clustered in several areas of the lake and several small, isolated targets spread throughout the lake. (*Survey Report*, ARF 01-13-118)
- SAIC evaluated results from the 2003 geophysical survey and past sampling events (surface water, sediment and fish tissue sampling) in order to determine if sufficient data exists to accurately evaluate the AOC. Findings were documented in the *Strategy Document: Risk Screening and Closeout Strategy* (ARF 01-13-119). SAIC concluded that the preliminary data suggests the possibility that contaminants related to historic FNOD activities may be present in TCC Lake at levels which may present risks to aquatic life and the environment; however, insufficient data exists to determine what action, if any, is required.

Future Work: Based on the results of the closeout strategy, a conceptual site model will be developed in order to identify potential sources and transport pathways. The CSM will be used to guide the selection of future sampling media and sample locations at the lake. The CSM is scheduled for completion in FY05, at which point a Sampling and Analysis Plan will be developed. Upon approval of the SAP (projected in FY06), the field investigation will be conducted. Upon receipt of the analytical results, contaminants of potential concern will be identified and a Screening Level Ecological Risk Assessment and limited Human Health Risk Assessment will be conducted (FY07).

## A-6 Marine Corps Power Generation

[POU-10]

Size: The power generation facility is approximately 2300 square feet.

Location: This AOC is located northeast of the intersection of Armistead Road and College Drive.

History and Past Work: The power generation building housed a day tank used to fuel a generator, which powered a boiler system. A 12,000-gallon Above Ground Storage Tank (AST) was located outside the building on the east side. A transformer switch, possibly containing PCB-contaminated oil, is present on site and has not been investigated.

- In February 1999, EPA Region III issued a letter outlining Corps tasks requiring immediate attention. Item 2 was removal of the AST and its contents. (*Letter dated 11, ARF 04-01-007*)
- In April 1999, a Norfolk District contractor removed the 12,000-gallon AST, day tank and fuel lines. Soil samples were collected and tested for Total Petroleum Hydrocarbons – Diesel Range Organics (TPH-DRO), PCBs and Metals. TPH-DRO, PCBs and Metals concentrations were below detection limits. (*Closure Report, ARF 01-13-041*)
- The oil located inside the building was tested for PCBs, metals, and mercury and removed to a proper disposal facility by MicroPact Engineering. Documentation will be included in the Site Screening Process Report.
- The work plan for environmental sampling and asbestos characterization was approved during FY04.

Future Work: The field investigation will be conducted during FY05, and the site will be evaluated in accordance with the SSP.

## A-7 J-Lake

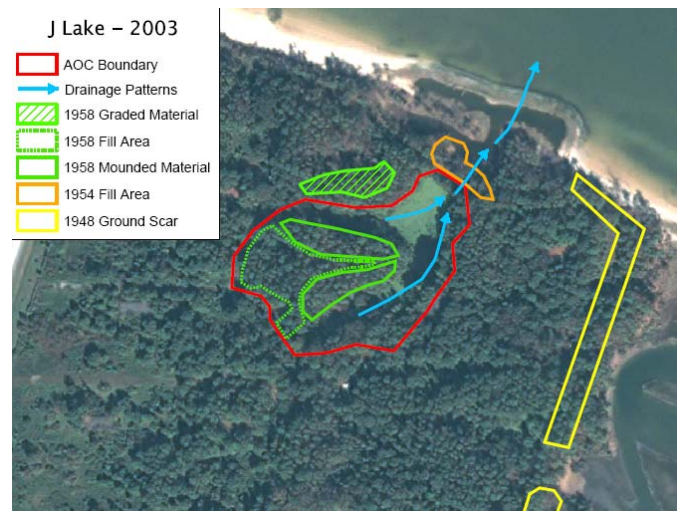
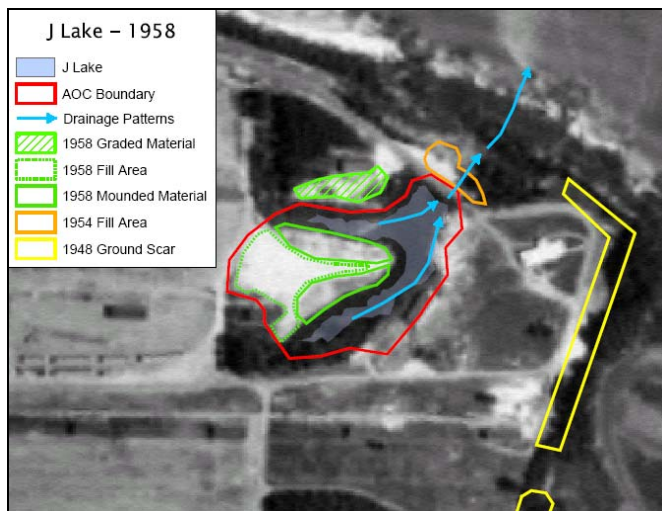
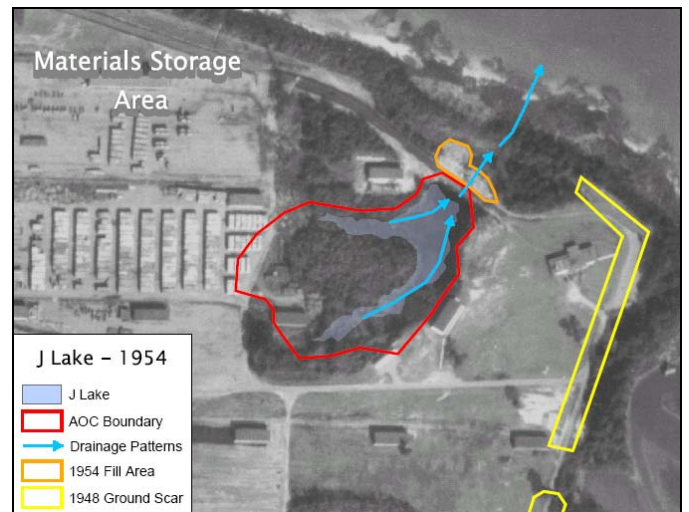
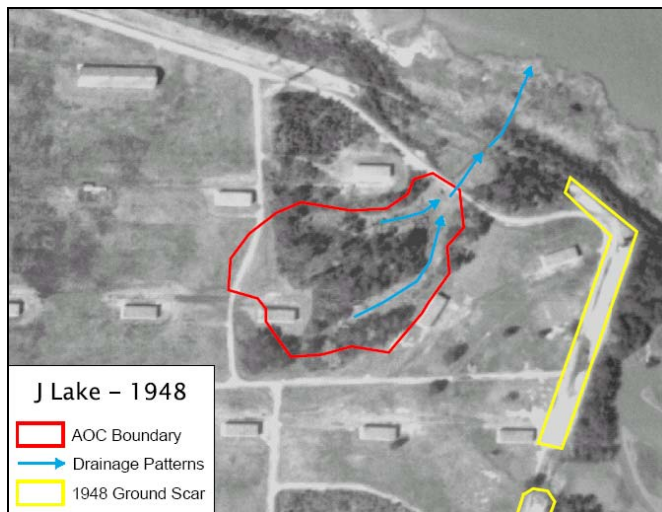
[OU-6]

Size: In addition to the lake and adjacent wetlands, the AOC includes the woods surrounding and bounded by the forks of the lake, for a total of approximately 5.3 acres.

Location: J-Lake is located between Interstate 664 and Streeter Creek, approximately 500 feet from the James River.

History and Past Work: In 1948, four Smokeless Powder Magazines surrounded wetlands, that would later become J-Lake, and ground scars were located east of the wetlands. By 1954 a fill area in the northeast section of the wetlands resulted in the lake being formed, and a materials storage area was located west of the lake. In 1958, a possible 55-gallon drum storage area was observed in the materials storage area; mounded material was located between the forks of the lake; graded areas and fill areas were northeast and west of the lake. (*General Map dated January 1937*, ARF 05-02-023 and *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003)

- In 1997, a geophysical survey was performed in the wooded area bounded by the lake where the mounded material and graded and filled areas were formerly located. Twenty-two of 57 anomalies were investigated, but none were MEC related (*EE/CA*, ARF 01-04-007-F).
- Also in 1997, Gannett Flemming conducted multimedia sampling in the J-Lake area, which included surface water, sediment and fish tissue samples. (*Desktop Audit*, April 2002, MicroPact)
- A Desktop Audit was issued in 2002. It identified COPCs for the surface water, sediment and fish tissue based earlier sampling efforts.
- During July 2003, SAIC performed a geophysical survey at the J-Lake AOC. (*White Paper dated 28 August 2003*, ARF 04-01-11.2)
- A geophysical survey was conducted during June of 2004 in conjunction with the nearshore investigation of the JRB. Several targets, possibly debris, were identified in the lake. (*Survey Report*, ARF 01-13-118)



**Future Work:** Results from the 2003 geophysical survey and past sampling events (surface water, sediment and fish tissue sampling) will be reviewed in order to determine if sufficient data exists to accurately evaluate the AOC. If additional sampling is necessary, the collection and analyses will be completed in FY05. Upon fulfilling the data requirements, the ecological and human health risks will be evaluated in accordance with the SSP, and a closeout strategy for the AOC will be developed.

## A-8 Track A Magazine Line

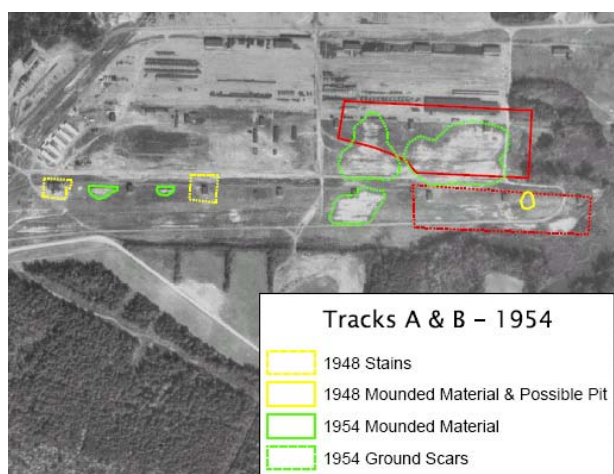
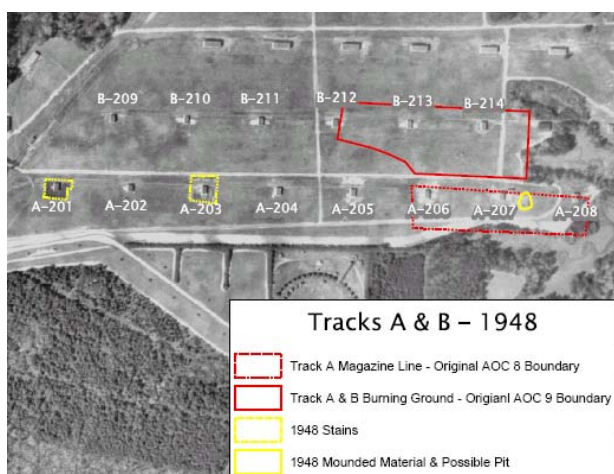
[POU-11]

Size: The Track A Explosive Magazine Line is approximately 9.7 acres.

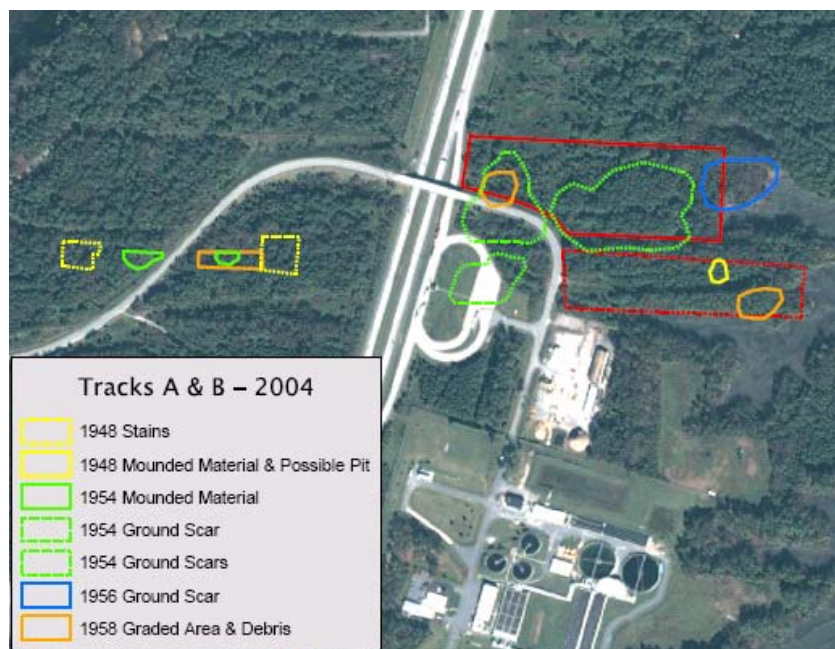
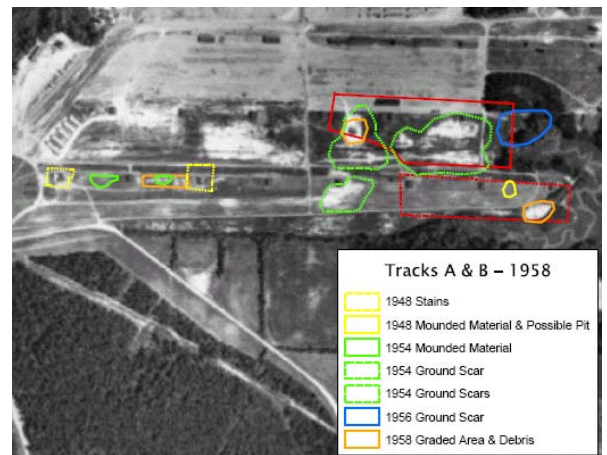
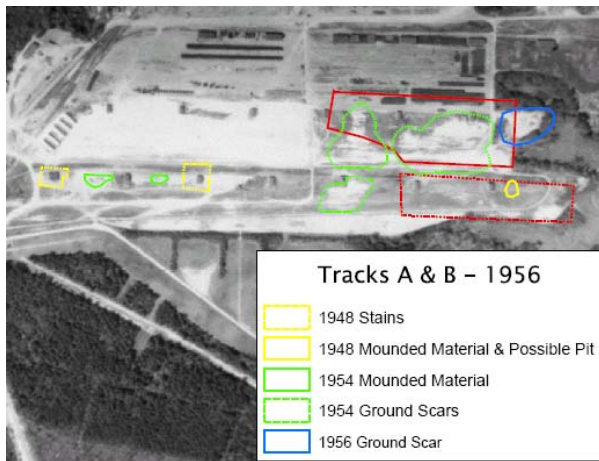
Location: The AOC is located between College Drive and Streeter Creek.

History and Past Work: Track A consisted of eight explosive magazines oriented east/west in a line, numbered A-201 through A-208 (from west to east). In 1948, stains were identified around buildings A-201 and A-203 and mounded material and a possible pit were located between buildings A-207 and A-208. In 1954, additional mounded material was observed between the westernmost buildings and a ground scar was just south of A-205. By 1958, light-toned material and debris were located between the westernmost buildings and a graded area with debris was located south of A-208. (*General Map dated January 1937*, ARF 05-02-023 and *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003)

- The 1997 geophysical survey resulted in no MEC related items being found. (*EE/CA*, ARF 01-04-007-F)







Future Work: AOC 8 will be investigation in conjunction with AOC 9 (Track A & B Burning Ground). It is anticipated that an SI will begin in FY05. The SI results will be evaluated in accordance with the SSP.

## A-9 Track A & B Burning Ground

[POU-11]

Size: The Track A & B Burning Ground is approximately 7.7 acres.

Location: The AOC is located between Interstate 664 and Streeter Creek near the Armistead Road overpass.

History and Past Work: Track A and Track B consisted of explosive magazines oriented east/west in two lines. In 1954, two large ground scars were identified between Tracks A and B. In 1956, a ground scar was observed east of B-214. By 1958, debris was located between the two magazine lines. (*General Map dated January 1937*, ARF 05-02-023 and *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003)

- During February of 1997, Weston, for EPA Region III, collected one soil sample from this area. (*Final HRS Package*, ARF 01-13-031)
- The 1997 geophysical survey resulted in no MEC related items being found. (*EE/CA*, ARF 01-04-007-F)

Future Work: AOC 9 will be investigation in conjunction with AOC 8 (Track A Magazine Line). It is anticipated that an SI will begin in FY05. The SI results will be evaluated in accordance with the SSP.

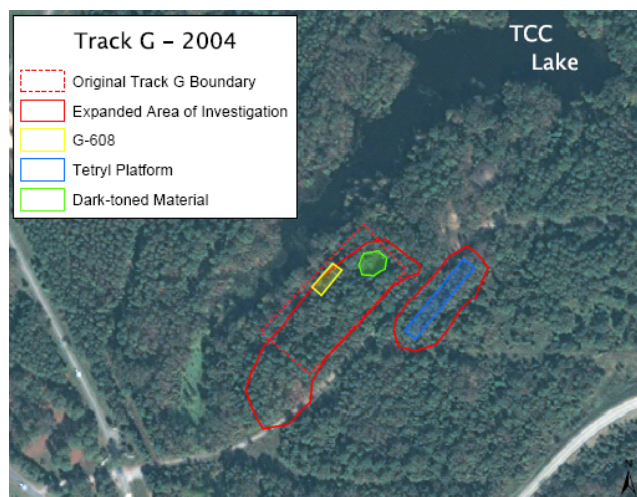
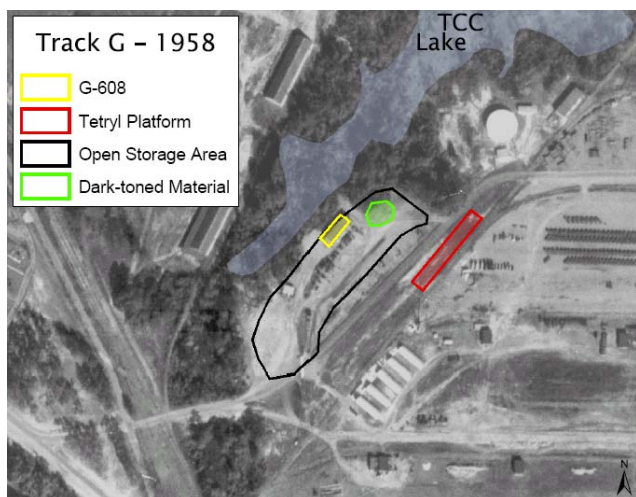
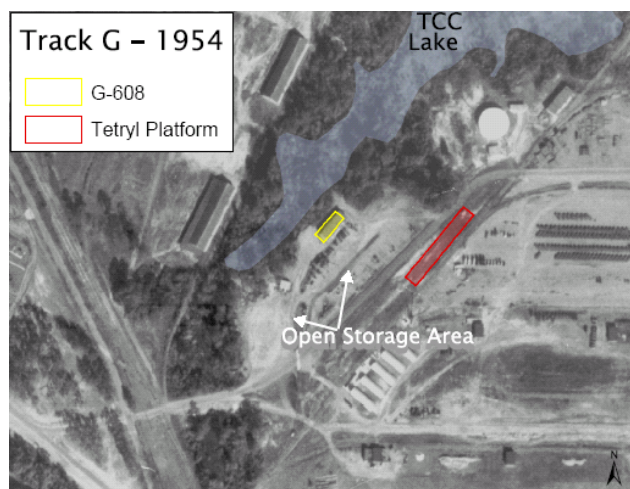
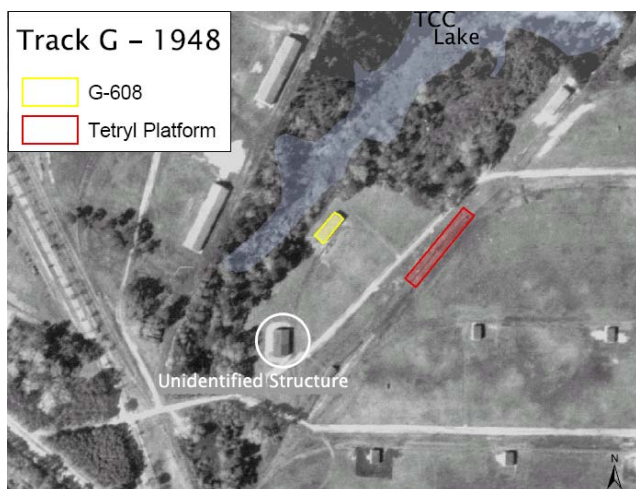
## A-10 Track G Magazine Line

[POU-9]

Size: Unknown.

Location: The AOC consists of one structure, G-608, located along the southeast edge of TCC Lake.

History and Past Work: G-608 was a Primer & Fuse Magazine. The General Map, revised in 1937, shows the existence of a tetryl platform east of G-608. In 1948, an unidentified structure was located southwest of G-608. In 1954, an open storage area was visible in the vicinity of G-608. And, in 1958, an unidentified dark-toned material was observed northeast of G-608. This AOC has not been investigated.





*(General Map dated January 1937, ARF 05-02-023, Historical Photo Analysis, ARF 05-01-005, and Site Analysis Volumes 1 & 2, ARF 01-01-003 & ARF 05-01-003)*

Future Work: A contract was awarded for a site investigation at this AOC. The focus of the SI will be the open storage area and the tetryl platform. A workplan for environmental sampling will be developed in FY05. Upon regulator approval, the field investigation will commence (late FY05, early FY06). Groundwater will be analyzed for VOCs, SVOCs, explosives, and metals, and soil will be analyzed for SVOCs, explosives, and metals. The SI results will be evaluated in accordance with the SSP, and a completed SI Report is anticipated during FY06. Further action at the site will be determined based on the results of the SSP.

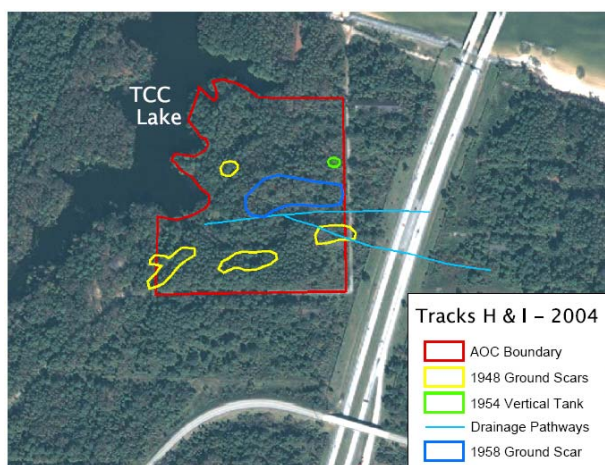
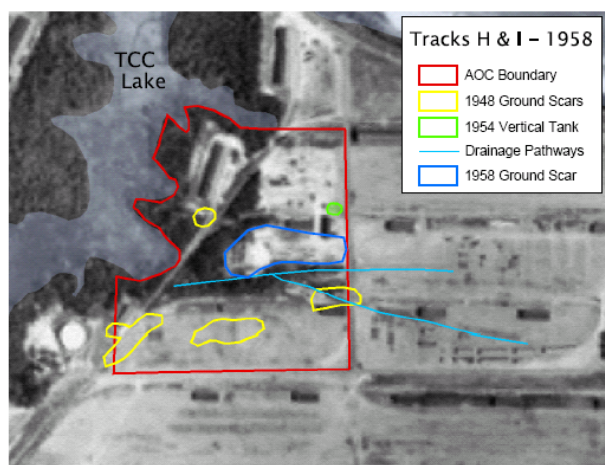
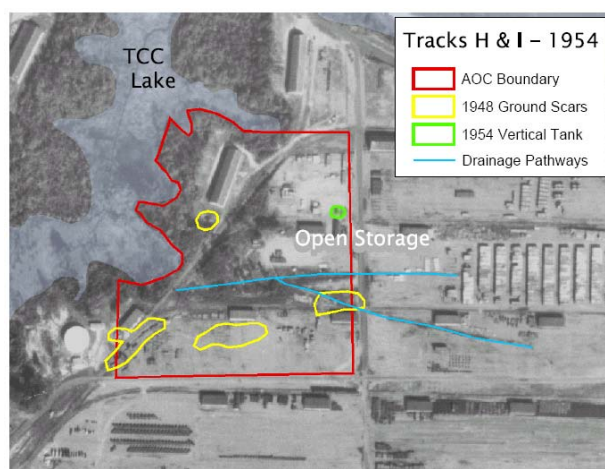
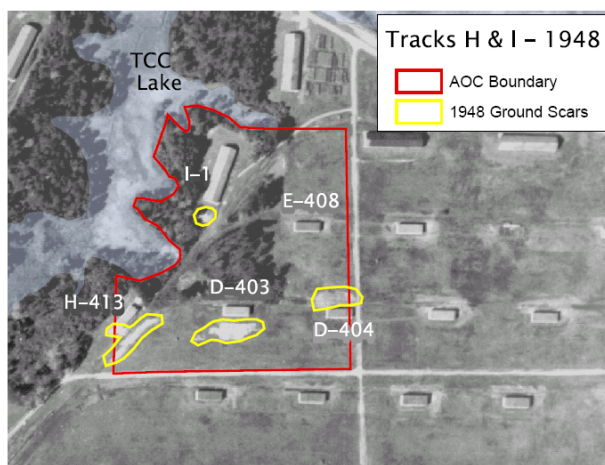
## A-11 Track H and I Magazine Line (Scars)

[POU-9]

Size: Unknown.

Location: This AOC is the rectangular area east of TCC Lake, which includes buildings I-1, H-413, D-403, D-404, and E-408.

History and Past Work: I-1 was an Ammunition Magazine, and H-413, D-403, D-404, and E-409 were Smokeless Powder Magazines. In 1948, ground scars were located southeast of H-413, south of D-403, north of D-404, and south of I-1. In 1954, open storage areas and a vertical tank of unknown use, northeast of E-408, were observed. In 1958, a large ground scar was located south of E-408. In addition, drainage pathways existed across the open storage area, from east to west, across the AOC and emptying into TCC Lake.



*(General Map dated January 1937, ARF 05-02-023 and Site Analysis Volumes 1 & 2, ARF 01-01-003 & ARF 05-01-003)* This AOC has not been investigated.

Future Work: A contract was awarded for a site investigation at this AOC. The focus of the SI will be the ground scars, drainage pathways, and vertical tank footprint. A work plan for environmental sampling will be developed in FY05. Upon regulator approval, the field investigation will commence (late FY05, early FY06). Groundwater will be analyzed for VOCs, SVOCs, explosives, and metals, and soil will be analyzed for SVOCs, explosives, and metals. The SI results will be evaluated in accordance with the SSP, and a completed SI Report is anticipated during FY06. Further action at the site will be determined based on the results of the SSP.

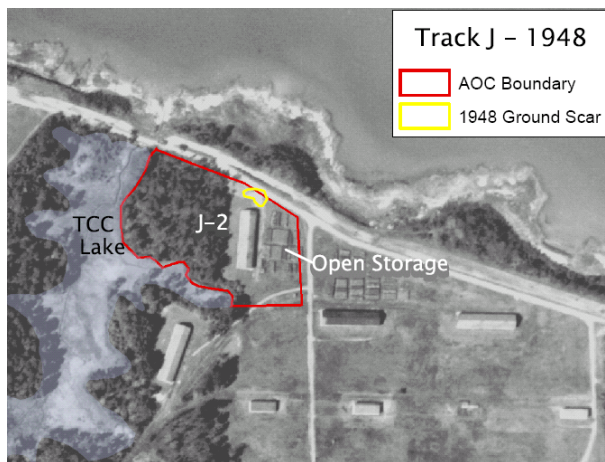
## A-12 Track J Magazine Line (Scars)

[POU-11]

Size: Unknown.

Location: The AOC consists of one structure, J-2, located along the northeast edge of TCC Lake.

History and Past Work: J-2 was an Ammunition Magazine. In 1948, a materials storage area was located immediately east of the building and a possible ground scar was located north of the building.



(General Map dated January 1937, ARF 05-02-023 and Site Analysis Volumes 1 & 2, ARF 01-01-003 & ARF 05-01-003) This AOC has not been investigated.

Future Work: The focus of an anticipated SI will be the ground scar immediately north of J-2. The SI results will be evaluated in accordance with the SSP.

### A-13 Abandoned Structures (Former Wastewater Treatment Plant)

[POU-10]

Size: The AOC is approximately 1/3 of an acre.

Location: The former Wastewater Treatment Plant (WWTP) AOC is located southeast of the NRB. The AOC includes a tower and three abandoned structures. (*Meeting Minutes dated 16 August 2001*, ARF 10-01-001)

History and Past Work: In 1948, a pit was observed at the future location of the WWTP. By 1954, the pit was no longer visible as the WWTP was constructed over it. (*Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003)

Future Work: A site investigation of the abandoned structures and WWTP is planned and will occur in conjunction with the NRB SI. The SI work plan is complete and the field work is scheduled for FY05. The SI results will be evaluated in accordance with the SSP to assess the human health and ecological risk associated with the NRB and determine an appropriate course of remedial action at the site.

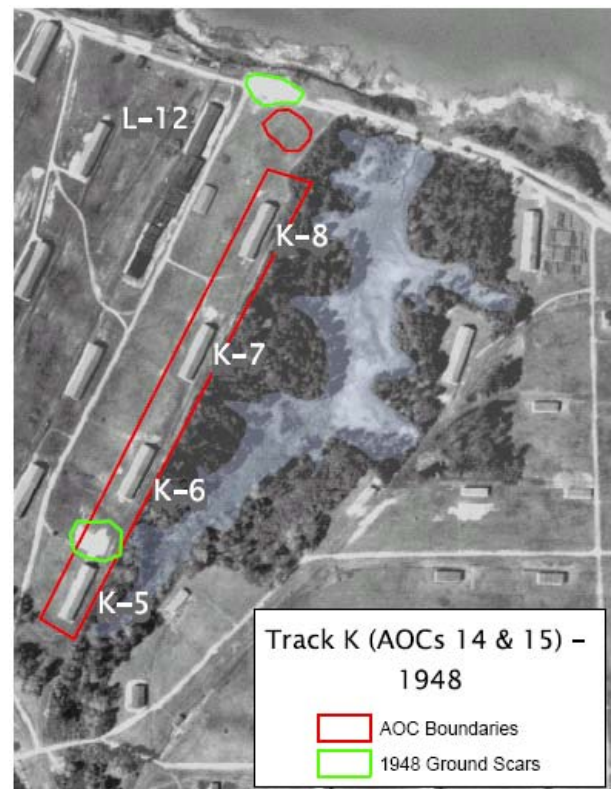
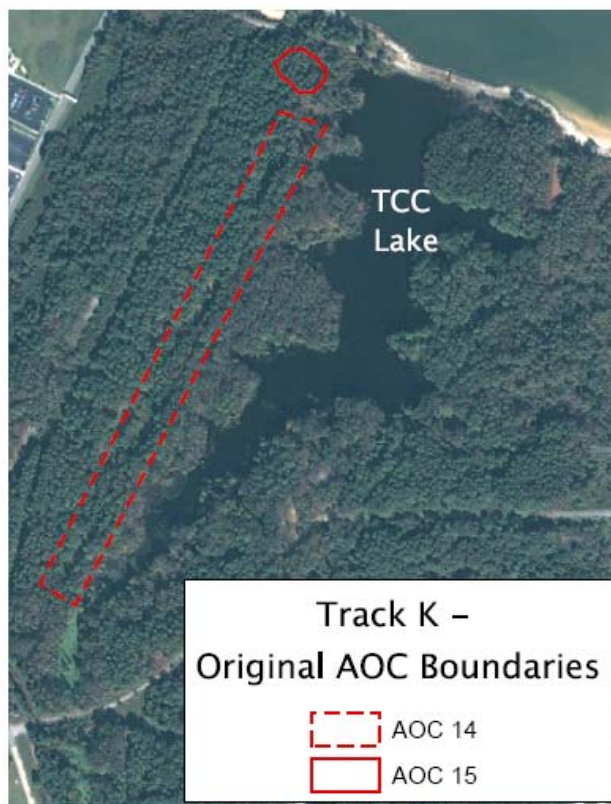


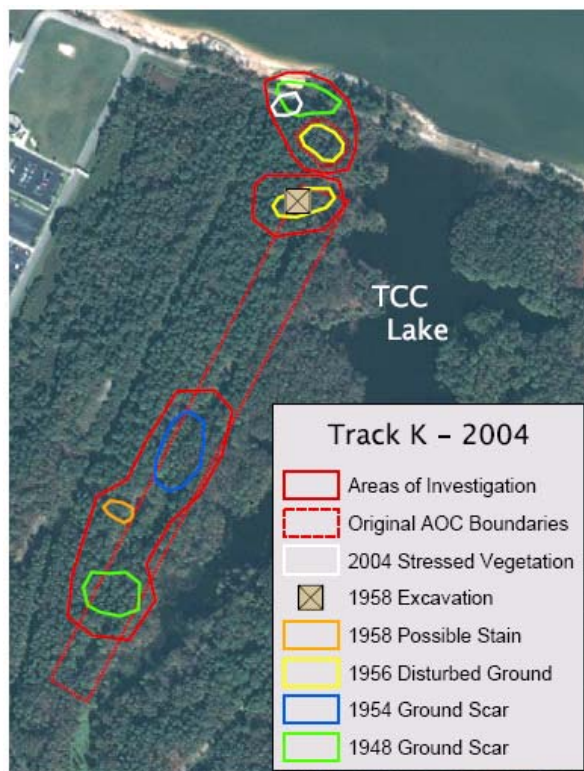
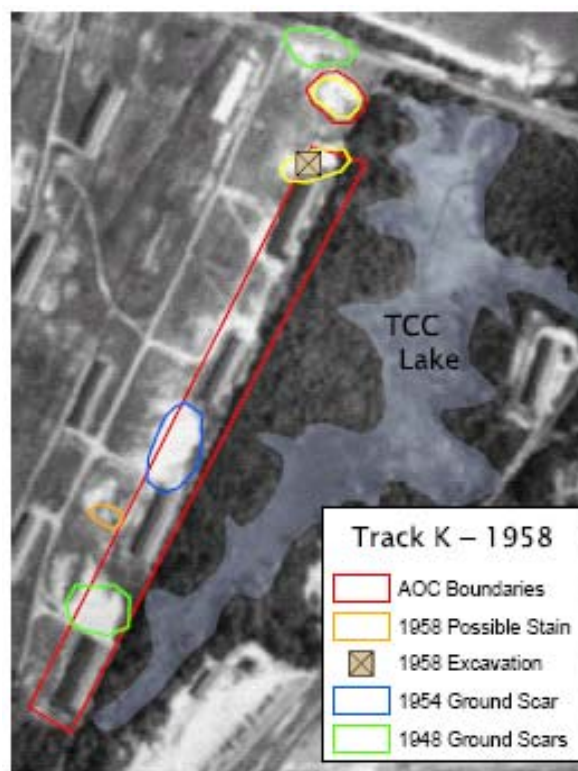
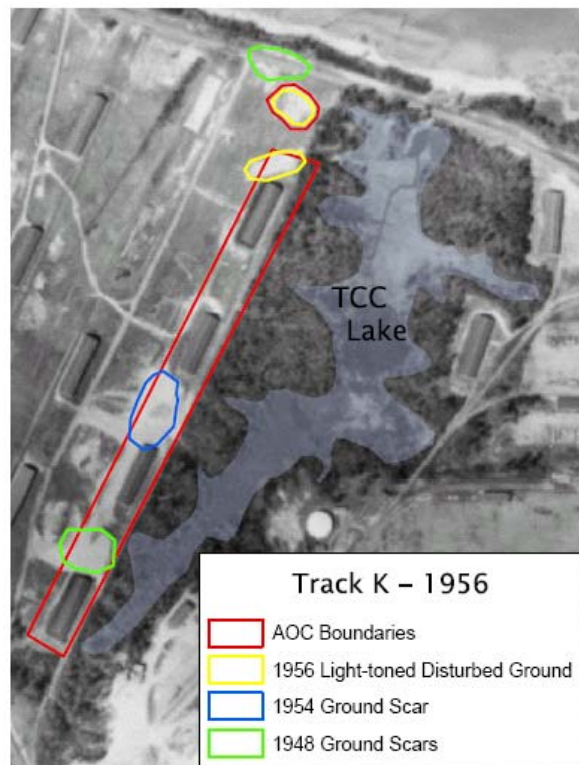
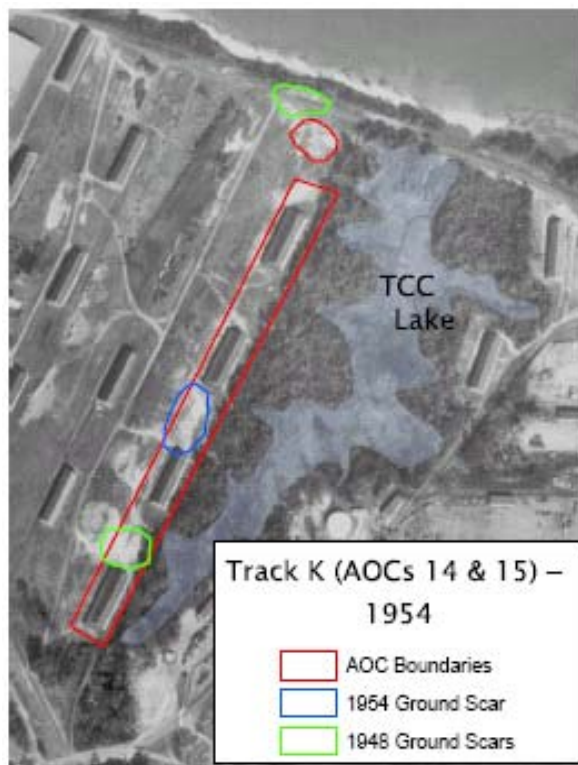
## A-14 Track K Magazine Line [POU-9]

Size: Unknown.

Location: The AOC is located on the west side of TCC Lake.

History and Past Work: Track K consisted of four Ammunition Magazines oriented north/south in a line, numbered K-5 through K-8. In 1948, a ground scar existed immediately north of K-5. In 1954, a ground scar was located north of K-6. In 1956 two areas of light-toned, disturbed ground were observed north of K-8. In 1958, a possible stain was observed just west of K-6, and an excavation was located immediately north of K-8. In 2002, an area of stressed vegetation was discovered north of K-8.





(*General Map dated January 1937*, ARF 05-02-023 and *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003, *Historical Photo Analysis*, ARF 05-01-005)

- The 1997 geophysical survey near K-8 and north of K-8 resulted in no MEC related items being found. (*EE/CA*, ARF 01-04-007-F)

Future Work: The focus of an anticipated SI will be the ground scars located north of K-5, north of K-6, and north of K-8. AOC 15 (the possible landfill and area of stressed vegetation) will be investigated in conjunction with AOC 14. The SI results will be evaluated in accordance with the SSP.



## A-15 Track K Magazine Line Landfill

[POU-9]

Size: Unknown.

Location: The AOC is located in the vicinity of former Magazine K-8.

History and Past Work: In 1948, a ground scar existed immediately northeast of a structure identified as Platform L-12. L-12 was located approximately 400 feet northwest of K-8. In 1956 two areas of light-toned, disturbed ground were observed north of K-8. In 1958, an excavation was located immediately north of K-8. An area of stressed vegetation can be seen on aerial photos through the 1970's. (*General Map dated January 1937*, ARF 05-02-023 and *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003, *Historical Photo Analysis*, ARF 05-01-005)

- The 1997 geophysical survey near K-8 and north of K-8 resulted in no MEC related items being found. (*EE/CA*, ARF 01-04-007-F)

Future Work: AOC 15 will be investigated in conjunction with AOC 14 and evaluated to determine if a landfill, possibly containing building debris from platform L-12, is present. The SI results will be evaluated in accordance with the SSP.

## A-16 Former Steam Heating Plant

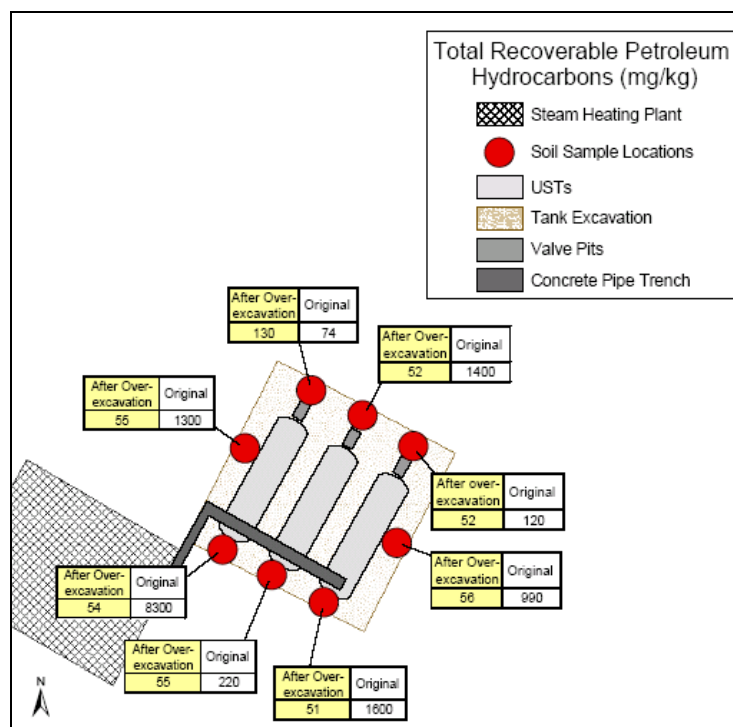
[POU-11]

Size: The Steam Heating Plant AOC is approximately 13,000 square feet.

Location: The Steam Plant was located between College Drive and Wellner (formerly Park) Drive at the southern end of Track R.

History and Past Work: The Steam Plant was used by FNOD and, most recently, TCC.

- In June 1991, a Site Survey Summary identified the presence of three abandoned Underground Storage Tanks (USTs) at the Steam Plant. Each tank had a 25,000-gallon capacity and the tanks, in addition to the piping and related equipment, still contained free product. (*Inventory Project Report*, ARF 01-03-006)
- TCC removed the Steam Heating Plant in 1993.
- During December 1994, the USTs and appurtenances were removed. Analysis of soil beneath the USTs indicated that a petroleum release occurred and resulted in the over-excavation and removal of 100 cubic yards of contaminated soil. Confirmatory soil sampling in the bottom of the excavation revealed decreasing concentrations of contamination at seven of the eight locations. The one location originally having a TRPH concentration below the VDEQ reporting limit (74 mg/kg) had a concentration of 130 mg/kg after over-excavation. (*Closure Report*, ARF 01-13-092)



Future Work: A Technical Memorandum documenting that the AOC requires No Further Action will be submitted in FY05.

## A-17 PCB Transformer Removal

[POU-10]

Size: Unknown.

Location: Unknown.

History and Past Work: FNOD-era utility poles may be present at some remote locations. Based on the time of operation, transformers on those poles may contain PCB-contaminated oil.

Future Work: Anticipate the SI will begin in FY06. The SI results will be evaluated in accordance with the SSP.

## A-18 Suspected Underground Storage Tank and Tunnel

[POU-10]

Size: Unknown.

Location: One suspected UST is located on TCC property under the Athletic Field North (AFN). A suspected underground tunnel was believed to be parallel to the former Track Q line of Magazines, in the northwest portion of FNOD (currently the TCC Truck Driver Training School).

History and Past Work: The AFN is one of several Areas of Interest identified at FNOD. Historical aerial photography reveals a building located near the present location of the suspected UST. The building first appeared in the 1948 aerial but no longer exists. No information concerning the function of the building was found. No local scarring or trenching is visible at the AFN in the historical photos.

- In July of 1999, SAIC conducted a geophysical survey of FNOD, including the AFN, identifying several anomalies. (*Final Field Report*, ARF 01-01-048 F)
- UXB investigated several anomalies identified during the 1999 geophysical survey and discovered a suspected UST in the AFN. It was left in place for future investigation. (*Final Report*, ARF 01-13-094)
- A suspected tunnel was identified during the 1999 geophysical investigation in the Truck Driver Training School area. In April 2000, TechLaw, for EPA Region III, investigated the structure. They determined that it was a reinforced concrete support foundation approximately 75 feet long x 12 feet wide x 8 feet deep. (*Trip Report*, ARF 01-02-010)
- A finding of No Further Action was issued on 23 February 2004 for the Suspect Underground Tunnel. (*Consensus Statement*, ARF 04-01-12.1)
- A site investigation was conducted at the AFN during September 2004 and included investigating test pits (burn layers); soil sampling; and determining and investigating the presence of the suspected UST.

Future Work: Results of the AFN SI will be evaluated in accordance with the SSP to determine if contamination is present, and the formal SSP Report will be issued in FY05. Should the SSP indicate COPCs, then human health and ecological risk will be assessed.

## A-19 TCE Contamination Adjacent to the James River Beachfront

Size: Unknown.

Location: Immediately south of the JRB Source Area.

History and Past Work: The JRB was a general disposal site used by the Army during FNOD operations. It is categorized as a SA based on the evidence of MEC, MUNITIONS DEBRIS and contaminated soil discovered at the site. During the 1998 JRB Site Investigation, monitoring wells were installed, two of which were placed in locations believed to be upgradient background.

- During the 1998 SI, TCE was detected in groundwater collected from the background wells at concentrations exceeding regulatory limits. (*Final SI*, ARF 01-13-027 F)
- During the 1999 EE/CA evaluation, TCE was detected in groundwater collected from one background well at a concentration exceeding regulatory limits. (*EE/CA*, ARF 01-04-012 F)
- In July 2002, a MW was installed south of the existing JRB background wells. Soil collected from the MW boring was analyzed, but no TCE was detected. (*Draft Summary of Groundwater Investigations*, ARF 01-13-109 v1)
- In October 2002, groundwater from the new MW was tested; however, no TCE was detected. (*Draft Summary of Groundwater Investigations*, ARF 01-13-109 v1)
- In January 2003, groundwater samples were collected from the two JRB wells and two of the JRB background wells. No TCE was detected (Method Detection Limit – 1 ug/L). (*Draft Summary of Groundwater Investigations*, ARF 01-13-109 v1)
- In June 2003, groundwater samples were collected from the two JRB wells and two of the JRB background wells. No TCE was detected (MDL – 1 ug/L). (*Draft Summary of Groundwater Investigations*, ARF 01-13-109 v1)
- The final quarterly groundwater samples were collected in December 2003 and no TCE was detected (MDL – 1 ug/L). (*Draft Summary of Groundwater Investigations*, ARF 01-13-109 v1)

Future Work: Results from the four quarterly sampling events indicate that TCE is not present above the detection limit. A finding of No Further Action will be requested for AOC 19 and the sampling results will be incorporated into the JRB Remedial Investigation. Completion of a NOFA finding is scheduled for FY05.

## A-20 Abandoned Water Treatment Plant

[POU-10]

Size: The Abandoned Water Treatment Plant (WTP) facility covers approximately ½ an acre.

Location: The AOC is between the southeast shore of TCC Lake and Club Drive, west of Smokeless Powder Magazine H-413.

History and Past Work: The Abandoned WTP was part of the water supply system for FNOD. The system included three water storage tanks, ten wells, a treatment plant and pumping stations. The system was designed such that the two smaller, elevated water tanks supplied the western half of the depot, and the Abandoned WTP supplied the eastern section. The Abandoned WTP included a million gallon, 95-foot diameter, aboveground water storage tank. Two buildings were located immediately south and northeast of the tank, one of which was a pump house. The abandoned water tank is still standing. One diesel pump was used in the system, but the location of the diesel pump is unclear. (*Master Shore Station Development Plan*, ARF 05-02-015; *Site Analysis Volumes 1 & 2*, ARF 01-01-003 & ARF 05-01-003)

- A February 2000 site visit revealed the existence of a possible UST adjacent to the pump house. (*Desktop Audit, March 2002*, 01-13-057 F)

Future Work: Investigation of the suspected UST will be conducted in conjunction with the TCC Lake AOC.

## A-21 Officer's Pool Chlorine Containers

[POU-9]

Size: This AOC is limited to the disinfection facilities at the pool.

Location: The Officer's Pool was located in the center of the depot between Tracks P and Q, southeast of the former Renovation Plant.

History and Past Work: The pool was used subsequent to DOD control of FNOD, and it is unknown when it was removed from service. Swimming pool chemicals (chlorine containers) were added to the AOC list in 2001 due to concerns about the potentially hazardous containers. (*Meeting Minutes dated 16 August 2001*, ARF 10-01-001)

- On 3 June 2003, the TCC Facilities Maintenance Department removed the swimming pool chemicals and shipped them to the Chemtron Corporation in Avon, Ohio for disposal. (*Letter dated 31 July 2003*, ARF 04-01-11.1)
- A finding of No Further Action was issued on 23 February 2004 for the Officer's Pool Chlorine Containers. (*Consensus Statement*, ARF 04-01-12.1)

Future Work: None required.



## 8 Other Relevant Investigations and Activities

### Land Use Control Implementation Plan

Land Use Controls (LUCs) include physical, legal or administrative mechanisms that restrict the use of, or limit access to, property at FNOD. LUCs are being implemented at known or suspected MEC sites to protect human health and the environment where risk is known, suspected, or cannot be totally eliminated. LUCs were an integral part of the 1998 Final EE/CA, the May 1999 Action Memorandum for non-time-critical MEC removal actions, the May 1999 Technical Memorandum signed by the Army and the EPA, and the December 1999 Interagency Agreement to Perform a Time Critical Removal Action for Ordnance and Explosive Safety Hazards.

Work developing the appropriate LUCs for FNOD began in mid-2000. A LUC Work Group meeting and RAB presentation were conducted in December 2001. Public comment on the LUCs was solicited and taken into consideration while drafting the final LUC Implementation Plan. During 2001, a Land Use Control Assurance Plan, Land use Control Options Paper, Risk Management Strategy Report, and Interim Land Use Control Implementation Plan (LUCIP) were developed. The Final LUCIP was issued in August 2002. (*Interim LUC Implementation Plan*, ARF 02-05-003 F)

Norfolk District is currently negotiating a Memorandum of Agreement (MOA) with the City of Suffolk, which will ensure implementation and enforcement of the institutional controls. Upon completion, Norfolk District will begin MOA negotiations with individual landowners.

Once MOAs are signed, the Norfolk District plans to discuss coordinating with Miss Utility in order to notify the public about the potential presence of MEC prior to excavation within FNOD boundaries.

### Time Critical Removal Action

In May 1999, the Norfolk District and EPA Region III entered into an Interagency Agreement to perform a Time Critical Removal Action (TCRA) at five locations on TCC property. The purpose of the TCRA was to locate potential HTRW disposal areas and single MEC items possibly existing in areas not fully investigated under the Final EE/CA issued in October 1998. (*IAG*, ARF 01-08-005). The geophysical survey areas, and the reasons for their investigation, are listed below:

- 1) TNT Source Area – The area beyond the boundary of previous HTRW and MEC investigations was investigated in order to determine if other disposal activities occurred in the vicinity of the TNT SA.

- 2) Athletic Fields (North & South) – Based on the terrain of these areas, they were included in the survey.
- 3) Renovation Plant Area - This area was used to renovate shells.
- 4) Buildings L-11 and L-12. - These magazines were destroyed by fire.
- 5) Building E-410 - This magazine was destroyed by fire.

The geophysical survey was started in July of 1999 with the TNT SA, North and South Athletic Fields, and Renovation Plant. Buildings L-11, L-12, and E-410 were surveyed at a later date. Final coordinates of potential disposal areas (pits and trenches) and single point magnetic anomalies were recorded and the locations were flagged for further investigation. (*Final Field Report*, ARF 01-01-048 & *Final Report MEC Removal Action*, ARF 01-13-094)

In January 2000, excavation and investigation of the anomalies began, and the process will be complete in early FY04, at which time a final report will be issued.

## Background Sampling Program

Weston, for USACE Baltimore District, conducted a Background Sampling Program in order to determine background concentrations of selected constituents in soil and groundwater. The results of the Background Sampling Report will be used in the risk assessment process to determine if analytical results acquired during investigations at AOCs are sufficiently different from background levels. The Background Sampling Program field activities (soil and groundwater sampling) were completed in two phases, beginning in November of 1999. Results of the 1<sup>st</sup> phase were reported in a November 2000 draft report, which recommended additional sampling in order to increase the level of precision and confidence in the original report. This second phase of sampling was completed in January 2002. Both soil and groundwater were evaluated for Metals, Volatile Organic Compound (VOC), Semivolatile Organic Compounds (SVOCs), Pesticides, PCBs, Explosives, Lead, Cyanide, Mercury, and Dioxins and the validated results are included in the Draft Final Background Sampling Program Report issued in August 2002. The Final Report was issued during FY04 and includes a 95% Upper Tolerance Limit table for detected compounds in soil and groundwater.

## Pesticide Drum Area

The Pesticide Drum Area is listed under Other Areas of Investigation (OAOI) as Site O-7. OAOIs are areas that may or may not be added to the list of AOCs based on the results of preliminary evaluations. In 1998, two unsealed, unmarked 55-gallons drums, one empty and one containing an unknown liquid, were found on TCC property in a wooded area bounded by Interstate 664, College Drive, and Armistead Avenue. In November of 1998, two surface soil samples were analyzed, and the suspect liquid was analyzed in May of 1999. Based on the soil and liquid analytical results, the SSP was initiated at the Pesticide Drum Area in early 2000. The drums were removed in November 2000 and screening level soil samples were collected. Based on those sampling results, four additional locations were sampled (surface and subsurface) in

February 2002. The validated results were compared to the SSP criteria, including background levels, and indicate that Dieldrin is a CoC. (Draft SSP, ARF 01-13-105)

During FY04, delineation soil sampling was conducted in order to determine the extent and levels of contamination present. In accordance with the FUDS guidance issued by USACE in 2004, an Engineering Evaluation and Cost Analysis will be conducted during FY05. Based on the results of the EECA, a remedial action will be selected and implemented during FY06.

## Hydrologic Conceptual Site Model

The hydrologic CSM is being developed to analyze the FNOD hydrologic system by investigating water flow in terms of mass balance and ground- and surface water budgets throughout the investigational area. A properly calibrated CSM is a numerical model that simulates groundwater flow, providing investigators a means to predict the fate and transport of groundwater contaminants. The hydrologic CSM has already contributed significantly to groundwater investigations for the overall FNOD site and will support future investigations of individual Source Areas and AOCs.

Data required for the CSM include seasonal groundwater and surface water elevations, soil and groundwater contaminant concentrations from recent and past investigations, and lithology from soil and monitoring well borings. In addition to site-wide monitoring wells, one off-site deep and shallow well cluster was installed in the Respass Beach Community. Staff gauges were installed in the Nansemond & James Rivers and Streeter Creek (2 at each location) and at TCC Lake, J Lake, Horseshoe Pond, GE Pond, and Dominion Pond (1 at each location). The eleven staff gauges will be used to evaluate surface water interaction within the overall local hydrologic system. The CSM identified several problem monitoring wells that were producing faulty data. Subsequent study of well construction and field visits uncovered problems, such as structural failure and clogged well screens, thus allowing investigators to purge the faulty data from the CSM database.

Hydrologic analysis is being conducted using MODFLOW-based software programs, primarily Groundwater Vistas and MODFLOW-SURFACT. The output files of these programs require only minor file adjustments to be compatible with the DOD's Groundwater Modeling System (GMS) software. A preliminary review of existing information indicates:

- The dominant steady-state shallow aquifer flow direction over the majority of the FNOD area is north, towards the James River. In the northwest corner, transient flow is probably more to the north-northwest during wet periods and during low tides, acknowledging the presence of the Nansemond River, but the CSM indicates that the effect of the Nansemond appears to be considerably less than previously believed. Thus, flow from the Dominion Lands area is predominantly due north, through the GE property and towards the James River. To the south, the flow is more to the northeast but also

towards the James River. At the southeast corner of the site, groundwater flows towards Streeter Creek which itself flows into the James River.

- Groundwater flow in the center of the site (Dominion Lands area) is more complex with some local mounding contributing to seasonal flow direction; however, the overall northerly flow component dominates over time. Particle tracking analysis has provided investigators with a much better understanding of local flow in this area.
- Groundwater flow into TCC Lake is best characterized as seasonal. During wetter periods, groundwater flows into the lake and, as water level within the lake increases, TCC Lake acts as a discharge source into the surface aquifer. Therefore, TCC Lake may act as a source of contamination when water levels are high and the lake is discharging to the aquifer. However, during the summer months, flow is reversed and the underlying aquifer discharges into TCC Lake. In any case, the dominant groundwater flow direction continues to be northerly, minimizing the chances of any potential contamination being carried from TCC Lake towards residential communities to the east, southeast and south.
- On the east side of FNOD, the CSM clearly demonstrates that Streeter Creek acts as a hydraulic divide preventing groundwater flow from FNOD from crossing Streeter Creek and reaching communities on the eastern side. Shallow groundwater flows from both the west and east into Streeter Creek, identifying this surface water body as a shallow aquifer discharge site. It appears that the flow in the underlying Yorktown Eastover (confined) aquifer is also controlled by this hydraulic divide, suggesting that deep production wells to the east of Streeter Creek are not being impacted by FNOD. To date, broad-spectrum chemical analyses of shallow and deep wells on both sides of Streeter Creek appear to support the hydrologic interpretation being provided by the CSM.

The hydrologic CSM will undergo continuous refinement as new data (chemical analysis, elevations, permeability and lithology) are collected over time. The first iteration of the CSM will be issued during FY04. Subsequent versions of the CSM will be issued as additional information becomes available.

## Residential Well Sampling

The Respass Beach neighborhood, located immediately east of the FNOD boundary and adjacent to Streeter Creek, obtains drinking and household-use water from private and community wells. Groundwater samples were collected from the Respass Beach residential wells on three occasions in order to evaluate the possibility of off-site migration of contaminants from FNOD. The latest sampling event occurred in April 2002. The neighborhood was divided into quadrants, and two residential wells (one shallow, one deep) were tested in each quadrant, for a total of eight wells tested. The analytical results were validated, and no FNOD-related contaminants were detected in the groundwater. However, MTBE (a fuel additive), Nitrates, Fluoride, and Sodium were above EPA Maximum Contaminant Levels. The owners of the tested

residential wells were notified of the analytical results. The VDEQ Tidewater Regional Office initiated an investigation into the one location where MTBE was detected and offered the residents an alternate water source, which the residents declined. The detections of Sodium and Fluoride were within normal regional aquifer levels. The residential well in which Nitrates were detected had other localized water quality issues of which the owner was aware. (*Analytical Report*, ARF 01-13-113) The City of Suffolk plans to extend municipal water and sewer lines to the Respass Beach Community.

Two additional monitoring wells (shallow & deep) were installed in the Respass Beach neighborhood to support the hydrologic CSM.

## 9 Potential HTRW Dig Sheet Items

During MEC investigations, “dig sheets” are completed detailing the location of the excavation and the items recovered. Upon reviewing several dig sheets, EPA Region III notified the Norfolk District of their desire to have non-MEC items, which could be potential HTRW issues (i.e. burn layers, slag, crushed drums, USTs, trash pits, etc...), documented and independently investigated as part of the SSP for the AOC in which the item was discovered. (*Letter dated 2 March 2000, ARF 04-01-008*).

The Norfolk District Project Engineer is notified as potential HTRW is discovered during MEC investigations. The Project Engineer documents the location and description of the items found and schedules further investigation, including media sampling, as close to the time of discovery as practicable.

All completed dig sheets are reviewed for possible HTRW. To track these items, Table 9.1 documenting potential HTRW issues is included in the SMP.

Table 9-1 – HTRW Issues

HTRW Issue	Location	Date Found	Investigation	Resolution
Tar-like substance	Pit 15 (soccer field adjacent to TNT SA)	February 2000	A layer of tar-like substance was discovered, along with construction debris, during an anomaly investigation. 5 composite soil samples were taken from the pit. The tar-like substance was placed in a 55-gallon drum.	TCC notified of debris (left in place) .
Tar-like substance	Pit 19 (soccer field adjacent to TNT SA)	February 2000	A Photoionization alarm sounded during an anomaly investigation. Construction debris and tar were discovered in pit. Three composite soil samples were collected from the pit.	
Burn Layer	MBG, Grid D-2	April 2001	A burn layer was discovered in a ditch leading from Steamout Pond, approximately 3 inches below the surface. Suspicious petroleum odors were noted.	Requires further investigation
Creosote	MBG, Grid E-3	December 2001	Suspect creosote mixed with construction debris was discovered during MEC investigation. Material was tested for VOCs and SVOCs. VDEQ evaluated analytical results and supporting documentation, classified as solid waste.	Debris removed and disposed of in permitted sanitary landfill.
Asbestos Piping and Debris	MBG	November 2001	Asbestos-encased pipes were discovered during an MEC investigation. Material was sampled and tested positive for asbestos.	22 bags of asbestos waste (pipes, scrap metal and contaminated soil) were removed and transported to permitted landfill for disposal. Confirmatory soil sampling conducted. Backhoe bucket decontaminated. Excavation backfilled with non-contaminated soil
Cylinder	MBG, Grid D-9	January 2002	Reactivities Management investigated and identified it as a hydraulic accumulator (non-hazardous and non-MEC).	Item disposed of with trash in January 2002.

HTRW Issue	Location	Date Found	Investigation	Resolution
Steam Table	MBG, Grid E-15	May 2002	Large sink (possible steam table) unearthed during an MEC investigation. A soil sample was collected and analyzed. Three compounds exceeded Industrial Soil RBCs.	Analytical results provided to MEC Contractor for review by the Certified Industrial Hygienist and Weston for inclusion in the MBG RI Report.
Asbestos Debris	MBG, Grid D-15	April 2003	Asbestos debris was discovered during an MEC investigation. Material was sampled and tested positive for asbestos.	
M1041 Gas Masks	MBG	December 2003	20 MI041 charcoal gas mask filter canisters unearthed. Filters analyzed for TCLP.	Filter media results negative. Filters disposed in municipal landfill.
75 mm Incendiary Round	NRB	April 2004	One 75mm incendiary round consisting of an outer casing containing lead oxide red (aka lead tetraoxide, CAS 1314-41-6). The lead oxide read must be disposed of as HTRW.	The round was detonated and the HTRW contents were packaged and removed to a certified HTRW waste disposal facility.



## 10 Ordnance Clearance Activities

Ordnance clearance activities began in 1987 soon after the discovery of the crystalline TNT at TCC.

- The original MEC sites included the TCC Retention Pond (east of the Beazley building), the JRB, and the TNT Source Area; however, only MEC-scrap was found at the Retention Pond and JRB.
- USACE Huntsville District supervised a geophysical survey and anomaly investigation at several locations throughout FNOD where there was the possibility of MEC being present. (*Final EE/CA*, ARF 01-04-007-F)
- Under the TCRA, geophysical surveys and anomaly investigations were conducted in the TNT Area, Athletic Fields (North & South), Renovation Plant Area, Buildings L-11 and L-12, and Building E410. (*Final Report to be issued during FY04*)
- Ongoing MEC investigations are occurring in the MBG SA and Horseshoe Pond.
- An MEC investigation is scheduled for the NRB during FY05.
- USACE Huntsville District provides construction support, as needed, during HRTW field activities in locations where MEC presence is known or suspected.

MEC found to date is listed in Table 10-1, FNOD Ordnance and Explosives Removal Summary

Table 10-1 - Ordnance &amp; Explosives Removal Summary

<b>FNOD Ordnance and Explosives Removal Summary As of 28 May 2004</b>								
Date	Area	UXO Items	DMM Items	Miscellaneous Munitions, pounds	Bulk Explosives, pounds	Munitions Debris (MD), pounds	Non-MD Scrap, pounds	Contaminated Soil, pounds
1975	TCC Shoreline		500		3,000			
1987	TNT Area		19	6,930	5,270		440	30,275
1992	TNT Area		2					190,000
1992	JRB		12					
1992	JRB		5					
1993	JRB		6					
1994-96	TCC Retention Pond					31,450		
1996-97	Main Burning Ground		6					
1996-97	Horse Shoe Pond		2					
1996-97	TDD Retention Pond		1					
1998	Impregnite Kit Area							1,720,000
1999-01	Pits and Trenches		408		1	157	1,956	
1999-01	Dominion Lands 1		127			110	2,296	
1999-01	Dominion Lands 2		66			586	2,700	
1999-01	L-11 / L-12 / E410		-				214,778	
1999-01	Main Burning Ground		194			13,808	135,826	
1999-01	JRB		-					
2001	Main Burning Ground		153			4,724	143,049	
2001	Pits and Trenches		454		0	6,175	18,328	
2001	TNT Area		14			171	319	
2002	Main Burning Ground		98			103,811	236,611	
2002	Dominion Lands 1/2		8			37	4,380	
2002	TNT Area		139	62	109	166	21,710	
2003	Main Burning Ground	-	13	-	-	283	217,916	-
2003	TNT Area	-	78	-	494	148	37,371	-
2003	JRB/NRB	-	1	-	-	153	-	-
2004	Main Burning Ground		61	-	-	492	135,941	
2004	TCC Ath.Flds & NRB		72	-	-	280	3,644	
2004	HSP		-	-	-	-	-	

*Former Nansemond Ordnance Depot  
Site Management Plan  
Fiscal Year 2005*

<b>CY 2001</b>								
<b>TOTAL</b>	<b>MBG</b>	-	<b>153</b>	-	-	<b>4,724</b>	<b>143,049</b>	-
<b>TOTAL</b>	<b>TCRA Pits and Trenches</b>	-	<b>454</b>	-	<b>0</b>	<b>6,175</b>	<b>18,328</b>	-
<b>TOTAL</b>	<b>TNT Area Pit 18</b>	-	<b>14</b>	-	-	<b>171</b>	<b>319</b>	-
		-	<b>621</b>	-	<b>0</b>	<b>11,070</b>	<b>161,696</b>	-

<b>CY 2002</b>								
<b>TOTAL</b>	<b>MBG</b>	-	<b>98</b>	-	-	<b>103,811</b>	<b>236,611</b>	-
<b>TOTAL</b>	<b>DLI 1 &amp; 2</b>	-	<b>8</b>	-	-	<b>37</b>	<b>4,380</b>	-
<b>TOTAL</b>	<b>TNT Area Pit 18</b>	-	<b>139</b>	<b>62</b>	<b>109</b>	<b>166</b>	<b>21,710</b>	-
<b>CY TOTAL</b>		-	<b>245</b>	<b>62</b>	<b>109</b>	<b>104,014</b>	<b>262,701</b>	-

<b>CY 2003</b>								
<b>TOTAL</b>	<b>MBG</b>	-	<b>13</b>	-	-	<b>283</b>	<b>217,916</b>	-
<b>TOTAL</b>	<b>TNT Area - Pit 18</b>	-	<b>78</b>	-	<b>494</b>	<b>148</b>	<b>37,371</b>	-
<b>TOTAL</b>	<b>JRB/NRB/HSP</b>	-	<b>1</b>	-	-	<b>153</b>	-	-
		-	<b>92</b>	-	<b>494</b>	<b>583</b>	<b>255,287</b>	-

<b>CY 2004</b>								
<b>TOTAL</b>	<b>MBG</b>	-	<b>61</b>	-	-	<b>492</b>	<b>135,941</b>	-
<b>TOTAL</b>	<b>TCC Ath. Flds &amp; NRB</b>	-	<b>72</b>	-	-	<b>280</b>	<b>3,644</b>	-
<b>TOTAL</b>	<b>HSP</b>	-	-	-	-	-	-	-
<b>0</b>	<b>0</b>	-	<b>133</b>	-	-	<b>772</b>	<b>139,585</b>	-

To-Date Totals		UXO Items	DMM Items	Miscellaneous Munitions, pounds	Bulk Explosives, pounds	Munitions Debris (MD), pounds	Non-MD Scrap, pounds	Contaminated Soil, pounds
		-	<b>2,439</b>	<b>6,992</b>	<b>8,874</b>	<b>162,550</b>	<b>1,177,265</b>	<b>1,940,275</b>

Table 10-1, continued.

## 11 References

- ARF 01-01-002      Engineering Report Ordnance Survey at Tidewater Community College Suffolk, Virginia; *Engineering, Design & Geosciences Group, Inc., January 1988.*
- ARF 01-01-003 &  
ARF 05-01-003      Site Analysis Tidewater Community College, Volumes 1 and 2; *Environmental Photographic Interpretation Center (EPIC), November 1987.*
- ARF 01-01-004      Surface and Subsurface Ordnance Clearance, Frederick Campus of Tidewater Community College, Suffolk, Virginia, Final Report; *EOD Technology, Inc., January 1989.*
- ARF 01-01-037      Analytical Report, Tidewater TNT/Nansemond Superfund Removal/Remedial; *Roy F. Weston for U.S. EPA Region III, April 1997.*
- ARF 01-01-046      Daily Report and Boring Logs; *EarthTech, December 1998.*
- ARF 01-01-048      Final Field Report for Geophysical Survey at Former Nansemond Ordnance Depot; *Science Applications International Corporation, November 1999.*
- ARF 01-01-049      Impregnite Area Confirmation Sampling Report; *MicroPact Engineering, May 2000.*
- ARF 01-01-055-F      Findings of an Environmental Survey of the Marine Offshore Areas of the Former Nansemond Ordnance Depot; *Science Applications International Corporation, September 2002.*
- ARF 01-01-058      Final Desktop Audit Summary Report for the Site Inspection, Streeter Creek Area of Concern, Former Nansemond Ordnance Depot; *MicroPact Engineering, Inc., April 2002.*
- ARF 01-02-001      Trip Report - Nansemond Ordnance Depot Assessment; *Roy F. Weston, Inc., January 1996.*
- ARF 01-02-002      Trip Report - Initial Site Reconnaissance; *Gannett Fleming, July 1996.*

ARF 01-02-010	Trip Report - Suspect Tunnel Location Survey; TechLaw, Inc., November 2001.
ARF 01-03-006	DERP-FUDS Inventory Project Report (INPR) for Site No. C03VA004600, Nansemond Ordnance Depot Steam Plant, Suffolk, VA; <i>USACE Norfolk District, June 1991.</i>
ARF 01-03-009	HTRW Investigations; <i>USACE Norfolk District, ongoing.</i>
ARF 01-04-007-F	Final Engineering Evaluation/Cost Analysis, Former Nansemond Ordnance Depot; <i>Foster Wheeler Environmental Corporation, October 1998.</i>
ARF 01-04-012-F	Engineering Evaluation/Cost Analysis (EE/CA), The James River Beachfront Area; <i>Roy F. Weston, Inc., April 2000.</i>
ARF 01-05-004	Final Groundwater Remedial Investigation Addendum, Tidewater Community College (Former Nansemond Ordnance Depot), Suffolk, Virginia; <i>CDM Federal Programs Corporation, February 1996.</i>
ARF 01-05-008	Remedial Investigation of the Main Burning Ground/Steamout Pond Area and the Horseshoe Pond Area, Remedial Investigation Report. <i>Roy F. Weston, Inc., August 2000.</i>
ARF 01-05-009	Supplement to the Remedial Investigation of the Main Burning Ground/Steamout Pond Area and the Horseshoe Pond Area, Remedial Investigation Report. <i>Roy F. Weston, Inc., October 2002.</i>
ARF 01-05-010	Technical Memorandum dated August 28, 2003, Subject: Supplemental Remedial Investigation, Horseshoe Pond Berm and Nansemond River Shoreline, Sampling in Support of the Screening Level Ecological Risk Assessments; <i>Weston Solutions, Inc.</i>
ARF 01-08-005	Interagency Agreement to Perform a Time Critical Removal Action for Ordnance and Explosive Safety Hazards, U.S.E.P.A. Region III, December 1999.
ARF 01-12-001-F	Engineering Report Groundwater Contamination and Remedial Action Investigation at Tidewater Community College Suffolk, Virginia; <i>Engineering, Design &amp; Geosciences Group, Inc., January 1988.</i>
ARF 01-12-002 F	Final Remediation Report; <i>Earth Tech, January 2003.</i>

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ARF 01-13-006 F	Archives Search Report Findings and Archives Search Report Archives Search Report Conclusions and Recommendations; <i>USACE St. Louis, December 1993.</i>
ARF 01-13-027 F	Final Site Investigation Report, Former Nansemond Ordnance Depot, James River Beachfront Area; <i>USACE Baltimore District, HTRW Branch, December 1998.</i>
ARF 01-13-090	Final Desktop Audit Summary Report for the Site Inspection, J-Area Lake Area of Concern; <i>MicroPact Engineering, April 2002.</i>
ARF 01-13-108	Draft Desktop Audit Summary Report for the Site Inspection/Removal Action, GE Pond and Culvert; <i>USACE Norfolk District, October 2002.</i>
ARF 01-13-012-F	Final Report Nansemond Ordnance Depot (NOD) Site Removal Assessment Chesapeake, Virginia; <i>Roy F. Weston, January 1996.</i>
ARF 01-13-013	Environmental Screening Investigation, Phase III, Proposed Bridgeway Commerce Park; <i>Malcolm Pirnie, March 1996.</i>
ARF 01-13-027-F	Final Site Investigation Report Former Nansemond Ordnance Depot James River Beachfront Area; <i>USACE Baltimore District, December 1998.</i>
ARF 01-13-031	Final Hazard Ranking System ("HRS") Package. Former Nansemond Ordnance Depot (aka Tidewater Community College-Frederick [Portsmouth] Campus); <i>USEPA Region III, January 1999.</i>
ARF 01-13-031 #7	Final Remedial Investigation Report for Tidewater community College Nansemond Ordnance Depot) Suffolk, Virginia; <i>IT Corporation, June 1992.</i>
ARF 01-13-041	Aboveground Storage Tank Closure Report, <i>EarthTech, July 1999.</i>
ARF 01-13-053 v1	Draft Desktop Audit Summary Report for the Site Inspection/Removal Action, Nansemond River Beachfront Area of Concern, Former Nansemond Ordnance Depot, Suffolk, Virginia; <i>MicroPact Engineering, Inc., May 2000.</i>
ARF 01-13-057 F	Final Desktop Audit Summary Report for the Site Inspection, Tidewater Community College Lake Area of Concern; <i>MicroPact Engineering, Inc., March 2002.</i>
ARF 01-13-063-F	Final Risk Based Cleanup Criteria, Interim Removal Action, The James River Beachfront Area; <i>Roy F. Weston, July 2001.</i>

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ARF 01-13-064-F	Baseline Ecological Risk Assessment for the Marine Offshore Areas of the Former Nansemond Ordnance Depot; <i>Science Applications International Corporation, September 2002.</i>
ARF 01-13-066 F	Archives Search Report, Nansemond Ordnance Depot, City of Suffolk, Virginia; <i>USACE St. Louis District, December 1993.</i>
ARF 01-13-067	Programmatic Agreement among Norfolk District, U.S. Army Corp of Engineers, the U.S. Environmental Protection Agency Region III, and the Virginia Department of Historic Resources regarding the Former Nansemond Ordnance Depot; <i>EPA Region III, June 2001.</i>
ARF 01-13-070 F	Final Report TNT Contaminated Soil Removal Tidewater Community College, Suffolk, Virginia; <i>IT Corporation, June 1992.</i>
ARF 01-13-072	Summary of EPA Sampling Efforts at Former Nansemond Ordnance Depot; <i>Gannett Fleming, July 1998.</i>
ARF 01-13-080 F	Site Screening Process for the Former Nansemond Ordnance Depot, Suffolk, Virginia; <i>USACE Norfolk District, December 2001.</i>
ARF 01-13-082 F	Removal Operation at James and Nansemond River Beachfront Areas Final Technical Report; <i>Plexus Scientific Corporation, October 2002.</i>
ARF 01-13-084	After Action Report on Monitor Merrimack Diving Operation; <i>Explosive Ordnance Disposal Mobile Unit Two, Detachment Norfolk, July 2001.</i>
ARF 01-13-092	Underground Storage Tank Closure Report: Tidewater Community College, Nansemond Ordnance Old Steam Heating Facility; <i>Environmental Restoration Company, March 1995.</i>
ARF 01-13-094	Final Report Ordnance and Explosive Removal Action, Former Nansemond Ordnance Depot, Suffolk, Virginia; <i>UXB International, Inc., June 2002.</i>
ARF 01-13-101	Post Removal Action Confirmatory Sampling Report, Impregnite Kit Source Area; <i>USACE Norfolk District, October 2002.</i>
ARF 01-13-105	Draft Site Screening Process Report for the Pesticide Drum Area at the Former Nansemond Ordnance Depot; <i>HydroGeoLogic, Inc., February 2003.</i>

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ARF 01-13-106	Partial Deletion Docket for Soil in the Impregnation Kit Area; <i>U.S.E.P.A., March 2003.</i>
ARF 01-13-107 v1	Technical Evaluation of the TNT Source Area, Former Nansemond Ordnance Depot, Suffolk, Virginia; <i>USACE Norfolk District, October 2003.</i>
ARF 01-13-109 v1	Draft Summary of Groundwater Investigations, James River Beachfront Area of Concern; <i>USACE Norfolk District, August 2003.</i>
ARF 01-13-110 v1	Interim Site Screening Process Report for the Tire Pile/Paint Can Site at the Former Nansemond Ordnance Depot, Suffolk, Virginia; <i>HydroGeoLogic, Inc., July 2003.</i>
ARF 01-13-111 v1	Draft Technical Evaluation of the Nansemond River Beachfront Area of Concern; <i>USACE Norfolk District, July 2003.</i>
ARF 01-13-112 v1	Draft Final Report, Screening Level Ecological Risk Assessment for the Fishing Pier Area at the Former Nansemond Ordnance Depot; <i>Science Applications International Corporation, September 2003.</i>
ARF 01-13-113	Residential Well Sampling Analytical Report, Former Nansemond Ordnance Depot; <i>Durham Environmental Consulting, December 2002.</i>
ARF 01-13-118	Survey Report, 2003 Geophysical Survey of the James River Beachfront, TCC Lake, and J Lake and Addendum to 2003 Geophysical Survey Report, Assessment of Impacts from Hurricane Isabel; <i>SAIC, May 2004.</i>
ARF 01-13-120	Record of Decision for the Offshore Area; <i>USACE Norfolk District, May 2004.</i>
ARF 02-01-018 F	Final Work Plan for Removal Action at the Tire Pile/Paint Can Site, Former Nansemond Ordnance Depot; <i>HydroGeoLogic, Inc., April 2000.</i>
ARF 02-01-025	Archaeological Work Plan, Former Nansemond Ordnance Depot; <i>USACE Norfolk District, May 2000.</i>
ARF 02-03-020	Nansemond Ordnance Site – Sampling Plan; <i>Roy F. Weston, Inc., February 1997.</i>
ARF 02-05-003 F	Interim Land Use Control Implementation Plan; <i>Science Applications International Corporation, August 2002.</i>

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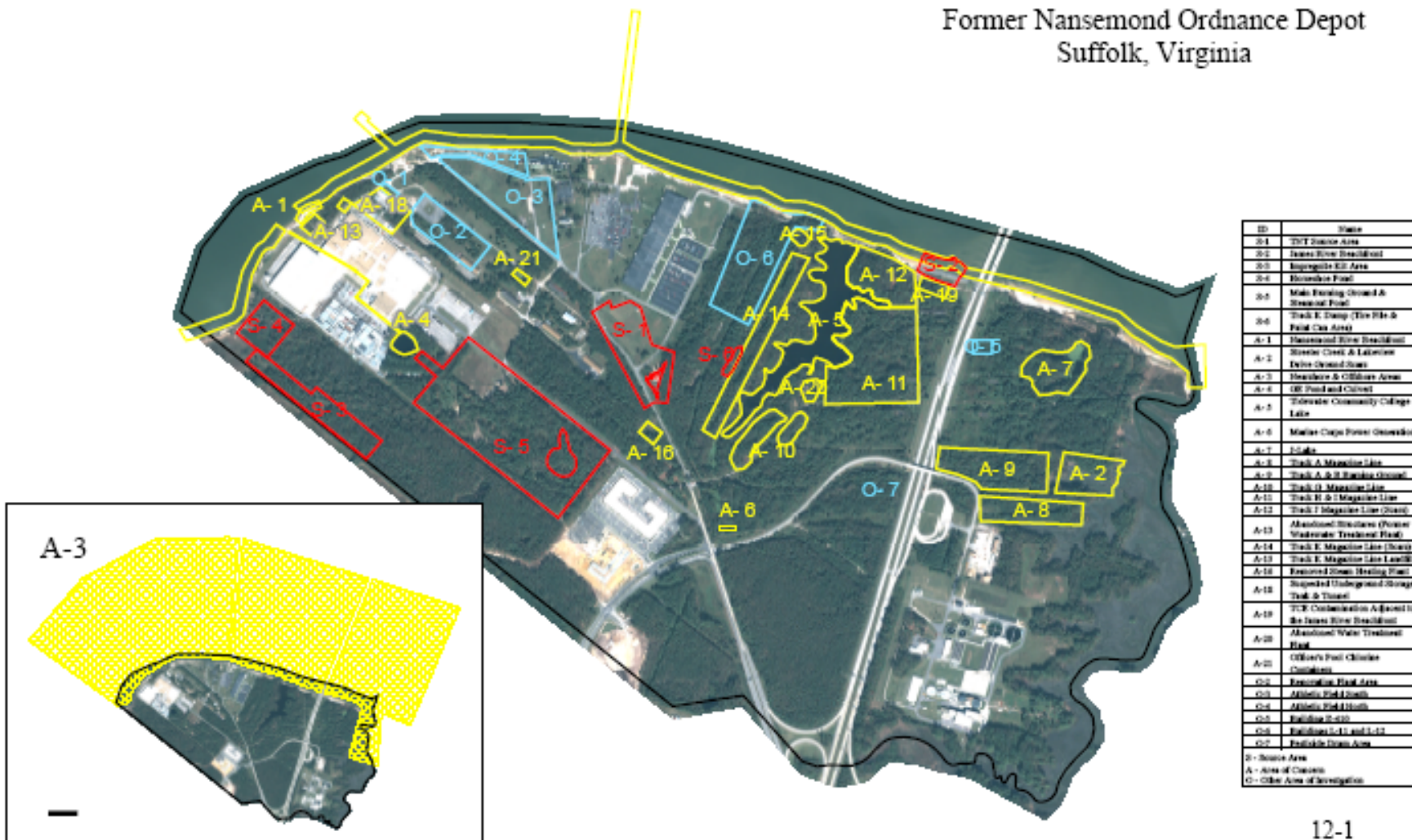
ARF 04-01-007	Miscellaneous Correspondence 1999 Letter from EPA Region III dated 11 February 1999, Subject: Former Nansemond Ordnance Works.
ARF 04-01-008	Miscellaneous Correspondence 2000 Letter from EPA Region III dated 2 March 2000, Subject: Identification of Site Screening Areas.
ARF 04-01-010	Miscellaneous Correspondence 2002, Letter from VDEQ dated 8 April 2002, Subject: 800050, Suffolk, Tidewater Community College, Suffolk.
ARF 04-01-011	Miscellaneous Correspondence 2003, Letter from TCC dated 31 July 2003, Subject: Swimming Pool Chemicals.
ARF 04-01-012	Miscellaneous Correspondence 2004, Consensus Letter dated 23 February 2004, Subject: Officer's Pool Chlorine Containers and Suspect Underground Tunnel.
ARF 04-01-012	Miscellaneous Correspondence 2004, Coring Survey Field Report, James River Beachfront dated 6 August 2004.
ARF 04-02-005	Action Memorandum dated 15 October 2003, Subject: Contaminated TNT Source Area soil.
ARF 05-01-005	Historical Photo Analysis, Nansemond Ordnance Depot, Suffolk, Virginia; <i>U.S. Army Topographic Engineering Center, March 1997.</i>
ARF 05-02-015	Master Shore Station Development Plan, West Area Utilities, Water Supply System; <i>Department of the Navy, Bureau of Yards and Docks, March 1955.</i>
ARF 05-02-023	Nansemond Ordnance Depot General Map; <i>Ordnance Department U.S.A., January 1937.</i>
ARF 06-01-035	Result of Excavation of a Human Burial at Site 44SK481; <i>Cultural Resources Incorporated, August 2002.</i>
ARF 06-01-065	Memorandum for the Record, Former Nansemond Ordnance Depot, Streeter Creek Unidentified Structure Investigation; <i>USACE Norfolk District, September 2001.</i>
ARF 07-01-013	Data Validation Report SDG 202159, Organic and Inorganic Fractions; <i>HydroGeoLogic, Inc., July 2003.</i>

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ARF 07-02-032	GE Suffolk Sediment Results; <i>Montgomery Watson Harza, July 2002.</i>
ARF 07-02-033	Analytical Report Tidewater TNT/Nansemond Superfund Removal/Remedial; <i>U.S.E.P.A. Region III Office of Analytical Services and Quality Assurance, April 1997.</i>
ARF 07-03-009	Fish Tissue and Sediment Results, August 2000 Sampling Event; <i>Virginia Department of Environmental Quality, August 2000.</i>
ARF 10-01-001	Partnering (non-RAB) Meeting Minutes

12-1 Site Figure

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## 13 Regulator Comments and USACE Responses

U.S. Environmental Protection Agency, Region III Comments:

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Virginia Department of Environmental Quality Comments:

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Response to Comments: